QK1
.B152
no 21
- 28

No. 21 1940-1941

Nos. 21-28

BARTONIA

PROCEEDINGS OF THE PHILADELPHIA BOTANICAL CLUB

CONTENTS

A Woodfern Hybrid Deserves a Name .... Edgar T. Wherry 1

Amaranthus of Philadelphia and Vicinity .... Louis C. Wheeler 2

A New Azalea from the Mountains of Georgia .... W. P. Lemmon 5

Two more Available Plant Names of William Bartram .... Francis Harper 6

The Location of Walther Schumann's Mexican Collecting Locality, "Jaral" Cornelius H. Muller 8

The Ferns and Lycosphens of Pennsylvania .... Edgar T. Wherry 11

Botanical Collectors of the Philadelphia Area .... Francis W. Pennell 38

Program of Meetings during 1939, 1940, and 1941 58

List of Officers and Members 59

Index 62

x6.00

Published by the Club
Academy of Natural Sciences, Nineteenth and the Parkway,
Philadelphia
Issued May 27, 1942

MISSOURI BOTANICAL
RECEIVED
JUL 3 1942

SHOUT
SHARE
IT

BARTONIA

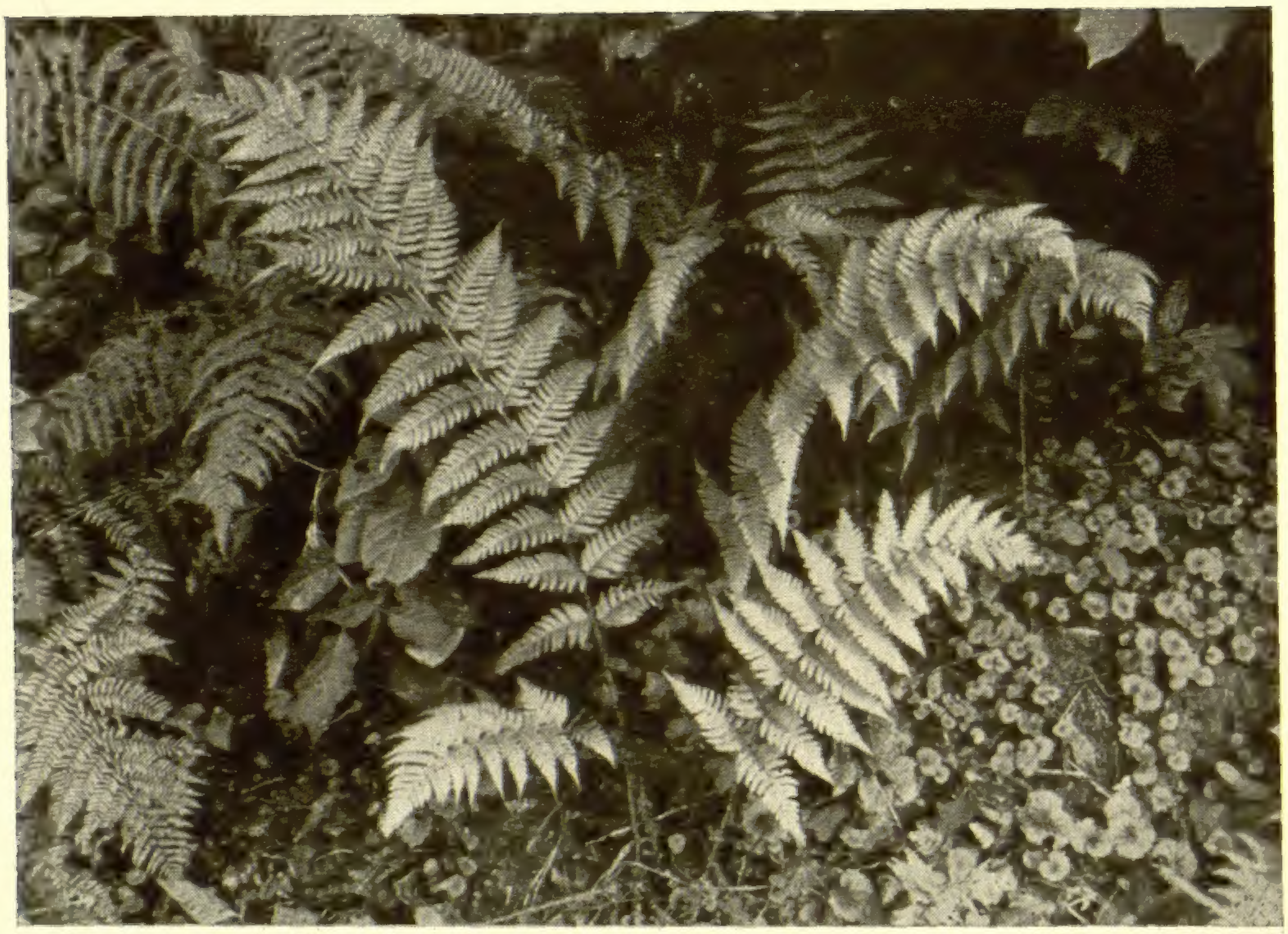
Proceedings of the Philadelphia Botanical Club.

A journal devoted to the Flora of the mid-eastern and south-eastern United States, especially of eastern Pennsylvania, New Jersey and Delaware.

Subscription Price, $1.00. Numbers 1-10, 50 cents each; later numbers, $1.00 each.

Contributors of articles having four or more pages will receive gratis fifty reprints. Additional reprints, if ordered in advance, may be purchased at cost.

Address
DR. FRANCIS W. PENNELL,
Editor,
Academy of Natural Sciences, Logan Square, Philadelphia, Pa.



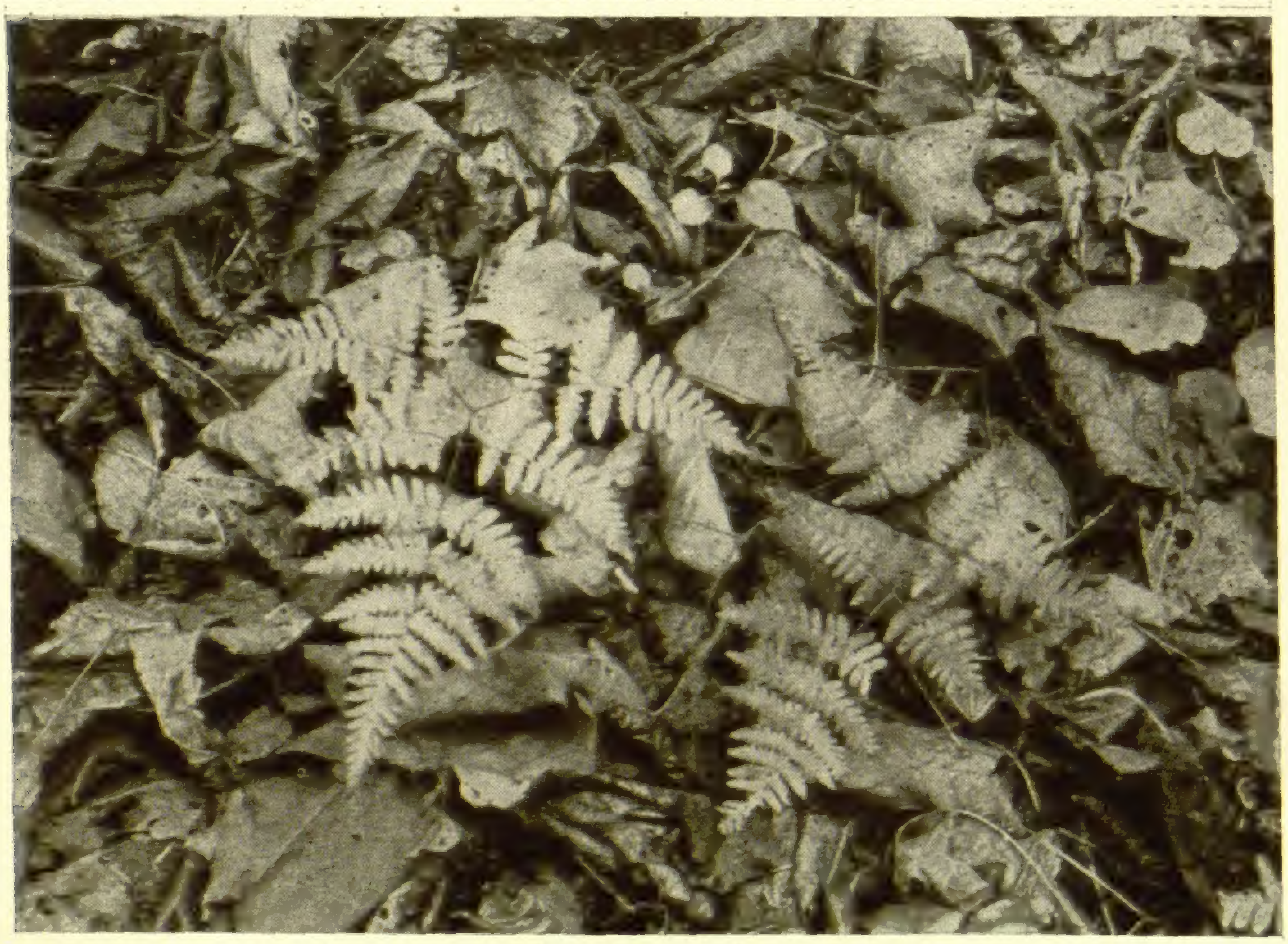


FIG. 1. (upper) *Dryopteris leedsii* Wherry, Maryland.

FIG. 2. (lower) *Currania robertiana* (Hoffm.) Wherry, in Blair County, Pennsylvania.

BARTONIA

PROCEEDINGS OF THE PHILADELPHIA BOTANICAL CLUB

No. 21 PHILADELPHIA, PA. 1940-1941

A Woodfern Hybrid Deserves a Name

Edgar T. Wherry

When a hybrid between two well-known species of plants appears only rarely or sporadically, and gives no indication of being able to perpetuate itself, a special name for it is rarely necessary or desirable. On the other hand, when the protoplasmic makeup of two species is such that their hybrids are frequent and at least locally prove able to reproduce without reverting to parent types, independent epithets may well be applied to them.

Among ferns we have such cases of acceptable quasi-species names assigned to more or less obvious hybrids in the cases of *Dryopteris boottii* (Tuckerm.) Underw., which represents *D. cristata* X *intermedia*; *Dryopteris celsa* (Palmer) Small, which seems to be *D. clintoniana* X *goldiana*; and *Asplenium ebenoides* Scott, recently renamed *Asplenosorus ebenoides* (Scott) Wherry.[1] which has actually been synthesized from its evident parents *Asplenium platyneuron* and *Camptosorus rhizophyllus*.

The hybrid between *Dryopteris goldiana* and *D. marginalis* was apparently first recorded by Dowell,[2] although no individual name seems ever to have been applied to it. That it may become locally abundant was pointed out in a recent paper on the way in which the hybrid combines the features of the parents by Greenfield.[3] Several years ago the late Arthur N. Leeds discovered the largest colony known to date, on the bank of the Susquehanna river below the Conowingo Dam in Harford County, Maryland.

A few field notes on this colony may well be placed on record. A careful estimate indicated that in the autumn of 1941 at least 200 individual plants were present. They are of all sizes, from huge clumps with fronds up to at least 150 cm. tall, down to infants showing only the first leaf and having the prothallium still attached; there can be no question that the hybrid is reproducing itself.

---

[1] Amer. Fern Jour. 27: 56, 1937.

[2] Bull. Torr. Bot. Club 35: 139, 1908.

[3] Amer. Fern Jour. 28: 55, 1938.

As noted in Mr. Greenfield's article above referred to, individuals vary somewhat, now approaching the one, and now the other parent in features, but there is no evidence of any reversion to parent stock. Indeed, although one parent, *D. marginalis,* is abundant in the immediate vicinity, the other, *D. goldiana,* is totally absent there, and has been observed to grow only at two stations respectively 2 and 3 miles distant. It may of course have grown nearer at one time and have been destroyed by the clearing of the land for agriculture; but in any case, spores of ferns can blow considerable distances, and hybrids sometimes appear remote from one of the parents.

In view of the above circumstances, a name for the plant concerned seems appropriate; it may well be:

X **Dryopteris leedsii** Wherry. Plate 1, fig. 1.

(*D. goldiana* X *D. marginalis* Dowell)

Plant strikingly intermediate between the parent species; fronds evergreen, the sori averaging about medial in position. (Planta hybrida inter *Dryopterem goldianam* et *D. marginalem,* foliis sempervirentibus, soris medialibus.)

Type, in the herbarium of the Academy of Natural Sciences of Philadelphia, collected at the above-mentioned locality by Arthur N. Leeds, No. 287, May 30, 1931.

Amaranthus of Philadelphia and Vicinity

LOUIS CUTTER WHEELER

Most species of *Amaranthus* are relegated to the despised category of "weeds" and ignored though a few as *A. tricolor* Hort. and *A. caudatus* L. are cultivated for their bright-colored foliage or both flowers and foliage. At least two species have been used as esculents, and olericulturists may look to this genus for the stock from which to develop a pot herb devoid of the poisonous oxalic acid which makes spinach (*Spinacia oleracea* L.) of doubtful desirability. *Amaranthus blitum* has a race which is cultivated and used as greens in southern Europe. Rafinesque, in his Medical Flora, states that *A. pumilus* may be pickled like other fleshy sea plants.

There are several species of *Amaranthus* which have been either introduced into this area recently or have lain misdetermined or neglected in herbaria. Discussion of these follows. The following abbreviations are used for the herbaria in which the specimens cited are deposited: (A)—Academy of Natural Sciences, Philadelphia; (P)—University of Pennsylvania, Philadelphia.

AMARANTHUS BLITUM L.; ballast iron-ore heaps, Bethlehem, Pennsylvania, Nov., 1890, *R. G. Bechdolt* (A). This plant is introduced from Europe. Lack of additional collections indicates that it has not become established in spite of the abundantly fruiting condition of the single plant collected in 1890. Identity has been confirmed by comparison with European specimens at the Academy of Natural Sciences, Philadelphia, and in the U. S. National Herbarium, Washington, D. C.

A. CRASSIPES Schlecht.; on ballast, Kaighns Point, Camden, "*Herbarium of Isaac Burk,*" (P). This casual introduction probably came from the West Indies or Florida since that is the range of the species given by Standley, North American Flora 21: 104. 1917.

A. PALMERI S. Wats., Delaware River & Pennsylvania Railroad Bridge, Richmond, Philadelphia, Oct. 12, 1938, *Thomas O'Neill* (P); along Delaware River, north of Pennsylvania Railroad Bridge, Richmond, Philadelphia, Oct. 7, 1937, *Thomas O'Neill* (P); land filled in with mostly coal ashes, ca. 0.2 miles southeast of intersection of Marshall Road and 69th Street Boulevard (future site of Drexel Institute Stadium), Upper Darby, Sept. 30, 1941, *L. C. Wheeler 5560* (P). This introduction from the western U. S. may persist and become a part of the naturalized flora.

A. PUMILUS Raf.; ballast ground below Navy Yard, Philadelphia, July 23, 1865, *E. D[iffenbaugh]* (A). There is little occasion for astonishment in finding this plant of the adjacent sea-coast here. Lack of subsequent collections suggests that conditions were unsuitable for establishment.

A. TORREYI (A. Gray) Benth.; land filled in with mostly coal ashes, ca. 0.2 miles southeast of intersection of Marshall Road and 69th Street Boulevard (future site of Drexel Institute Stadium), Upper Darby, Delaware County, Pennsylvania, Sept. 30, 1941, *L. C. Wheeler 5563* (P); Lakewood roadside east of Red Lion, Burlington County, New Jersey, Oct. 3, 1932, *W. H. Witte* (P). It is quite possible that this introduction from west of the Mississippi may persist as it has been collected in Virginia by Fernald & Long, and in Michigan by Farwell. In herbaria it may be sought among the specimens of *Acnida* since staminate specimens of some species of *Acnida* are difficultly distinguishable from staminate specimens of *Amaranthus Torreyi.*

A. VIRIDIS L.; on ship ballast, Girard Point, Philadelphia, July 23, 1878, "*Herbarium of Isaac Burk*" (A). Standley, North American Flora 21: 117. 1917 called this plant *A. gracilis* Desf., but according to Merrill, Amer. Journ. Bot. 23: 609-612. 1936, the specimen in the Linnaean Herbarium is to be taken as type of the Linnaean species which fixes *A. viridis* as the correct name for this plant. This species is pantropic in its distribution.

In order to encourage collectors to take an interest in collecting *Amaranthus* and to assist students in identification of the species of this difficult genus, the following key for the identification of the species of *Amaranthus* known to occur in Pennsylvania is appended:

1. Utricle indehiscent; flowers always monoecious.
   2. Paired stipular spines borne at each node; utricle abruptly contracted above the middle into a wrinkled portion filled with spongy tissue, smooth and membranous below; sepals and stamens 5. .... *A. spinosus* L.

2. Plants wholly devoid of spines of any sort; utricle tapering gradually above, essentially uniform throughout and entirely hollow.

    3. Pistillate sepals broadly spathulate; utricle papillate; peduncles thickened and hardened at maturity of fruit; (pistillate sepals 5; staminate sepals 4; stamens 3; anthers ca. 0.5 mm. long; seeds ca. 1 mm. long) .... *A. crassipes* Schlecht.

    3. Pistillate sepals elliptic-lanceolate; utricle never papillate; peduncles not thickened.

        4. Sepals 2 or 3; seeds ca. 1 mm. long; stamens 2 or 3, anthers 0.5–0.6 mm. long, thecae obtuse; inflorescence usually both of terminal often spiciform panicles and small axillary clusters.

            5. Utricle twice as long as the seed (ca. 2 mm. long), smooth even when dry; seed oval in outline; stamens and sepals 2. .... *A. deflexus* L.

            5. Utricle less than twice as long as the seed (ca. 1.6 mm. long), more or less rugulose at least when dry; seed orbicular in outline; stamens 3; sepals 3 at least in the staminate flowers.

                6. Utricle strongly rugulose even when fresh; sepals 3 and similar in the pistillate flowers; larger leaves deltoid-ovate, tapering, not at all or but slightly emarginate. .... *A. viridis* L.

                6. Utricle no more than faintly rugulose; sepals mostly 2 in the pistillate flowers, the third, if present, much smaller; larger leaves ovate-spathulate to shortly ovate-oblong, deeply emarginate .... *A. lividus* L.

        4. Sepals 5; seeds 2–2.3 mm. long; stamens 5, anthers 1.1–1.2 mm. long, thecae acute; inflorescence only in short axillary clusters .... *A. pumilus* Raf.

1. Utricle perfectly circumscissally dehiscent; flowers sometimes dioecious.

    7. Inflorescence of only small axillary clusters; low plants (less than 1 m. tall); usually either prostrate or decumbent or profusely branched.

        8. Stamens mostly 4, (rarely 5 or 3); anthers 1.2–1.3 mm. long; pistillate sepals mostly 5 (rarely 4); staminate sepals mostly 4 (rarely 5 or 3); seeds 1.3–1.7 mm. in diameter. .... *A. blitoides* S. Wats.

        8. Stamens 2 or 3; anthers 0.4–0.8 mm. long; pistillate sepals 3 (rarely 4); staminate sepals 3.

            9. Bracts greatly exceeding the flowers; both bracts and sepals attenuate into aristate tips; seeds 0.9–1.1 mm. in diameter .... *A. graecizans* L.

            9. Bracts shorter than the flowers; neither bracts nor sepals either attenuate or aristate; seeds 1.2–1.5 mm. in diameter .... *A. blitum* L.

    7. Inflorescence of terminal, often elongate and spiciform, panicles; axillary clusters or panicles also often present; plants erect, frequently tall (over 1 m.); stems simple or at least usually not profusely branched.

        10. Flowers dioecious; inflorescence green or at most faintly pinkish, long slender terminal spiciform ("rat-tail") panicles plus some smaller lateral or terminal panicles; pistillate sepals much the broadest toward the apex; foliage green.

            11. Bracts no longer than either pistillate or staminate calyx; seeds black; staminate sepals at most abruptly mucronate .... *A. Torreyi* (A. Gray) Benth.

            11. Bracts conspicuously exceeding both the staminate and pistillate calyx; seeds brown with a blackish cast; the outer staminate sepals slenderly attenuate into a bristle. .... *A. Palmeri* S. Wats.

        10. Flowers monoecious; terminal panicles either not long and slender, or pendulous and usually red; pistillate sepals broadest at about the middle, tapering above, or at least not obviously wider above; entire plant often reddish or purplish-red.

            12. Pistillate sepals linear-oblong, conspicuously exceeding the utricle, broadly spreading above. .... *A. retroflexus* L.

            12. Pistillate sepals tapering, shorter than or at least not conspicuously exceeding the utricle, not broadly spreading.

                13. Terminal spiciform panicle long (over 10 cm.) and (usually) pendulous; staminate flowers ca. 3 mm. long; anthers ca. 1.25 mm. long... *A. caudatus* L.

                13. Terminal spiciform panicle short (less than 10 cm.) and erect or slightly nodding; staminate flowers ca. 2 mm. long; anthers ca. 0.75 mm. long.
                A. hybridus L. (including *A. cruentus* L.)

A New Azalea from the Mountains of Georgia

W. P. LEMMON

Additional study of the Southern Mountain azaleas (see Bartonia 19: 14-17, 1938) has disclosed existence of another new species, which first attracted the attention of Mr. J. A. McKay in 1934, and has been under observation and study since then. There is only one known colony, of approximately one hundred plants, located in Vogel State Park at Neel Gap, Georgia, (although plant at Station 33, established on Gregory Bald in the Great Smoky Mtns. National Park, apparently is the new species; further study at blooming time will be necessary to definitely establish this). Plants showing hybridism with *A. arborescens* were found nearby, while specimens hybridized with some undetermined species have been transplanted by Mr. W. H. Reynolds, of Jonesboro, Ga., from a point on the South River about 4½ miles from that town, to his farm: the original colony being reported as containing six plants with no other azaleas within a half a mile. In the National Herbarium at Washington are specimens from Piedmont Georgia indicating parentage of the new species. In both of these cases the location is on the southern watershed and almost due south of the colony location at Neel Gap.

During the investigation of the new species, questions arose as to the possibility of its being a variety of either *A. arborescens* Pursh. or *Rhododendron roseum* Rehder. From *A. arborescens* the new species differs in type of growth, the eglandular pedicel, the unequal calyx-lobes, the white glands of the corolla hairs, and from all other known species in the coloring of the corolla.

From a southern pink-flowered specimen conforming so closely to Rehder's description of *R. roseum* it might be considered typical, the new species differs in type of growth, shape of leaves, glabrous twigs and winter buds, eglandular pedicels and calyx-lobes, the strongly ridged corolla-tube, the size and color of the corolla, the blooming period, absence of fragrance and complete absence of leaf transformation as indicated by apical awns on the winter budscales.

From *A. prinophylla* Small, the new species differs in type of growth, glabrous twigs, the thick, stiff mature leaves, shape of calyx-lobes, length of corolla-tube, color of corolla and absence of fragrance.

Honoring Mr. Robert T. Furbish, of Neel Gap, Ga., the new species may be known as *Azalea* **furbishii** Lemmon & McKay, spec. nov., and described as follows:

Shrub, not over 1.5 m. tall, much branched, flat-topped. Twigs grayish, glabrous or with an occasional hair. Winter buds ovoid-conical, 7–10 mm. long, 4–5 mm. in diameter, scales glabrous, less than 15 to first flower-bud, greenish-yellow edged with brown, tipped with short apical awns, ciliate. Leaves of an elliptic type, with slightly tapering base, blade gland-tipped. Petiole 2–4 mm. long, strigillose, channelled above, edges pubescent with long hairs. Blade 3–6 cm. long, 1.5–3 cm. wide; above light green, somewhat lucid, with veins and veinlets deeply impressed, midrib strigillose; beneath glaucesent, midrib strigillose and pubescent. Pedicel 5–8 mm. long, pale green, somewhat strigillose, eglandular. Calyx-lobes lanceolate, of unequal length, 1–2 mm. long, ciliate, base strigillose, eglandular. Corolla-tube 2-2.5 cm. long to beginning of expansion, strongly ridged, slightly arched near base, ridges light yellowish-green, valleys pinkish, pubescent and with some glandular hairs — the entire exterior of the corolla is definitely viscid. Limb oblique, the tube gradually expanding; color of the tube-ridges extending through midrib section of the lobes to the abrupt, sharply pointed, eglandular tips; color of the lobe-edges, within and without, a delicate shell-pink, the upper lobe with a large orange blotch, the midrib section sometimes being of a lighter shade. Upper lobe 15 mm. wide, 21 mm. long; laterals 12 mm. wide, 21 mm. long; lower 12 mm. wide, 21 mm. long; all tips recurving, edges somewhat revolute, the upper showing a marginal crease. Corolla-tube pubescent within, eglandular, the ribs very prominent. Filaments white and pubescent below, carmine above; anthers deep orange. Style carmine, pubescent at base only. Stigma dark carmine. Ovary densely pubescent with long hairs. Mature capsule ovoid, pubescent, 12 mm. long, 6 mm. in diameter.

(Frutex, 1–1.5 m. altus multiramosus; alabastri squamae ciliatae aristate; foliorum laminae ellipticae 3–6 cm. longae, supra glabrae, subtus glaucescentes costa strigillosa pubescenteque; calycis segmenta inaequalia ciliate; corollae tubus valde costatus, costis ochroleucis, sulcis roseis, 20–25 mm. longus et lobi 21 mm. longi rosei, supremo 15 mm. lato aurantiaco-signato; staminum filamenta pubescentia distaliter glabra; stylus basin pubescens.)

Type in herbarium of the Academy of Natural Sciences of Philadelphia, collected in flower June 17, 1939, at Vogel State Park, Neel Gap, Georgia, by W. P. Lemmon. Colony on south side of trail from the Gap to the reservoir. Physiographic province, Blue Ridge Mountains of Georgia and North Carolina, at elevations above 3000 feet.

Characteristic of this species is the low, flat-topped, heavily branched growth and the semi-fastigiate, rugose appearance of the thick, recurving leaves. A dark color form also occurs.

Two more Available Plant Names of William Bartram [1]

FRANCIS HARPER

On October 1, 1765, two new shrubs were discovered by John and William Bartram near Fort Barrington, McIntosh County, Georgia.[2] One of these was *Franklinia alatamaha* Marshall (1785); the other is currently known as *Pinckneya pubens* Michaux (Flora Boreali-Americana, vol. 1, p. 103, 1803). The younger

---

[1] Investigation supported by the John Bartram Association and aided by a grant from the Penrose Fund of the American Philosophical Society.

[2] *Cf.* Jenkins, Pennsylvania Mag. Hist. Biography, vol. 57, pp. 193-208, 1933; Harper and Leeds, Bartonia, no. 19, pp. 1-13, 1938.

Bartram (Travels, p. 16, 1791) gives descriptions of both species, but in this place applies no technical name to the latter. On pages 467-468 of the same work he gives a more extended description of *Franklinia*. At the same time (p. 468) he refers to ' the other new, singular and beautiful shrub,' and remarks in a footnote: ' I gave it the name of Bignonia bracteata extempore.' The last word is obviously an adverb modifying ' gave '; it forms no part of the plant name. This name, in connection with the description on page 16, is valid and available.

Further information on the subject has turned up in the shape of some manuscript notes that Bartram sent in 1788 to ' Friend Barclay ' in London, along with some drawings and plant specimens. This material has been preserved in the British Museum (Natural History), and photostat copies of the notes and drawings are in the Manuscripts Division of the Historical Society of Pennsylvania. On page 18 of the notes we read concerning ' *Bignonia bracteata* ':

' If it should prove to be a New Genus, I have a Request that It may be call'd BARTRAMIA (*bracteata*) in Memory of My Father John Bartram deceas'd, The *American Botanist & Naturalist*, Whose Labours, Travels, collections & Communications to the Curious in Europe hath contributed perhaps as much as that of any Man of his time, toward increasing the Stores of Botanical knowledge; with respect to North american productions.'

Since Bartram's specific name *bracteata* has 12 years' priority, it must replace Michaux's *pubens*. Accordingly, the Georgia bark is to be known hereafter as *Pinckneya* **bracteata** (Bartram) F. Harper, n. comb.

Even in 1788 the generic name *Bartramia* was preoccupied in Linnaeus (Sp. Pl., p. 389, 1753). The name proposed by Linnaeus also preoccupies *Bartramia* Hedwig (1789), currently used for a genus of mosses.

Bartram's manuscript notes, referred to above, also shed a final ray of light on the long-standing question, whether *Franklinia* and *Pinckneya* were found in close association. For in these notes he writes of having had the pleasure of seeing the latter ' in the spring season, together with the Franklinia which then flowered in sight of it.' A sand-hill bog 1.7 miles northwest of Cox, on the north side of the road leading to Fort Barrington (Everett City quadrangle, 1918), may be considered the type locality of both species. There is a specimen of *Pinckneya* from this locality in the herbarium of the Academy of Natural Sciences of Philadelphia; it was collected on April 8, 1933, by Arthur N. Leeds.

The *Magnolia pyramidata* of Bartram is another puzzling case, which does not seem hitherto to have been solved properly. The name is introduced (Travels, p. 6, 1791) as a *nomen nudum*, among a list of plants of Colonel's Island, on the coast of Liberty County, Georgia. On page 340 of the same work Bartram describes (but does not name) a new species of magnolia that he ' discovered in the maritime parts of Georgia, particularly on the banks of the Alatamaha.' Finally, on page 408, he gives a nomenclaturally valid description of *Magnolia pyramidata* from near the head of the Mobile Delta, Alabama. This tree and the one from the Altamaha are apparently identical with the one currently known as *M. pyramidata* Pursh (Flora Americae Septentrionalis, vol. 2, p. 382, 1814). Pursh gives a reference to Bartram, but does not specify the page, and his description is not an exact copy of Bartram's. In any event, Bartram must supersede Pursh as the author of the name *pyramidata.* It is rather remarkable that his valid description on page 408 has been so long overlooked. ' Bartram's magnolia ' is suggested as a fitting common name for this species.

Le Conte (Proc. Acad. Nat. Sci. Philadelphia, vol. 7, p. 174, 1855) considered the tree of Colonel's Island ' merely a variety of *M. grandiflora* '; but even if that were true, the *M. pyramidata* of page 6 would remain a *nomen nudum,* and the validity of the name on page 408 would not be affected.

The type locality is probably somewhere in the vicinity of Boatyard Lake, about 4 miles west of Tensaw, Alabama (soil map of Baldwin County, 1912). The herbarium of the Academy of Natural Sciences of Philadelphia contains a specimen collected about 7 miles south of this point, at Melton's Landing on the Tensaw River, on June 18, 1939.

SWARTHMORE, PA.

The Location of Walther Schumann's Mexican Collecting Locality, " Jaral "

CORNELIUS H. MULLER

There is to be found in recent monographs a distinct difference of opinion concerning the location of " Jaral " where Walther Schumann collected the bulk of his Mexican plants. Some opinions favor the identity of Schumann's Jaral with a locality in Coahuila, probably El Jarral, while others locate it in the south near the Federal District.

The author's attention was first drawn to the apparent inconsistency by the treatment of certain Schumann collections by Trelease[1] in his monograph of the American oaks. All four of the species collected by Schumann, allegedly at " Jaral, Coahuila," could have come equally as well from the south. One species, *Quercus macrophylla* Née, ranges from San Luis Potosí across Guanajuato to Michoacan and Jalisco. It is a species of definite tropical affinities and requirements and could not possibly grow near El Jarral, Coahuila, a locality on the severe desert northwest of Saltillo. Camus[2] followed Trelease without reservation in assigning Schumann's collections to Coahuila. Additional Schumann collections from Jaral have been credited to Coahuila by Hitchcock,[3] Chase,[4] and Brand.[5]

---

[1] Trelease, W., Mem. Nat. Acad. Sci. 20: 241. 1924.

[2] Camus, A., Monogr. Gen. Quercus. 1938-1939.

Pax and Hoffmann,[6] and Wolff,[7] place Schumann's Jaral in Hidalgo. It is very doubtful that the place is located in this state since the quite detailed map of Hidalgo in the *Atlas Geográphico de la República Mexicana* (Tacubaya, México, D.F., 1919-1921) bears no locality of that name. In one instance Pax and Hoffmann spell the name "Jacal."

Pilger[8] and Detling[9] locate Jaral in Guanajuato, a disposition which seems reasonable in view of certain other collections. For instance, a collection of *Lobelia fenestralis* Cav.[10] by Schumann is marked "Jaral, July 27, 1886." This species ranges from Oaxaca to Arizona and western Texas and is confined to the very high and mesic mountain habitats. It could scarcely be attributed to the low desert mountains northwest of Saltillo, Coahuila.

Salvia obtorta Epling is known only from the type collection by Schumann, marked "Jaral, September 7, 1885." Epling[11] records this as "Mexico prov. Guanajuato prope Jaral," and he has annotated the type sheet "prob. Jaral, Guanajuato."

Bidens angustissima H. B. K. is treated by Sherff[12] as ranging from "San Luis Potosí southwestward across State of Guanajuato to northeasternmost Jalisco." He cites Schumann no. 110, Jaral Mts., Oct. 10, 1886, inferring that this locality falls within that range.

Innumerable citations of Schumann's specimens are made under "Mexico: without locality" or "México: without locality: Jaral."

The only biographical sketch of Schumann at hand is given by Urban.[13] He writes as follows:

> **Schumann, Walter.** . . . . In 1884 he went to Haiti, where he collected in the environs of Port-au-Prince, and from there in the same year [he went] to Mexico. Here he obtained a position as head gardener at the Hacienda del Jaral in the vicinity of the capital city, ranged through the country from March [1884] to August 1888 collecting plants, birds, reptiles, and insects, and then became owner of a nursery in Mexico itself. [Author's translation from the German.]

---

[3] Hitchcock, A. S., Contr. U. S. Nat. Herb. 17: 216, 257, 270, 295, 301, 304, 310, 312. 1913.

[4] Chase, A., Contr. U. S. Nat. Herb. 28: 23. 1929.

[5] Brand, A., Pflanzenreich IV. 251: 146. 1913.

[6] Pax, F., and K. Hoffmann, Pflanzenreich IV. 147. XVI: 25, 27, 90. 1924.

[7] Wolff, H., Pflanzenreich IV. 228: 173, 186, 194, 196. 1913.

[8] Pilger, R., Pflanzenreich IV. 269: 398. 1937.

[9] Detling, L., Amer. Midl. Nat. 22: 516. 1939.

[10] The author is indebted to Dr. Rogers McVaugh of the Bureau of Plant Industry for the data on this species.

[11] Epling, C., Repert. Sp. Nov. Fedde Beih. 110: 217. 1939.

[12] Sherff, E. E., Field Mus. Bot. Ser. 16: 489. 1937.

[13] Urban, I., Symbolae Antillanae 3: 124. 1902.

Urban indicated that he received his information on this subject by correspondence from three sources, presumably men who knew Schumann and his work.

The author has received a letter dated September 19, 1941, from Sr. Alberto Covarrubias, administrator of the Hacienda Jaral de Berrio in Guanajuato, from which the following excerpt is translated:

> "I reply to your letter . . . . to state that truly the German Walther Schumann was at this Hacienda in the year 1888, charged with the garden of this ranch, and certainly with great ability, having sent then on various occasions many specimens of different plants of cactus or maguey to the United States."

It is doubtful that Schumann sent plants to the United States, but there is no doubt about the correctness of the remainder of this report which checks closely with Urban's sketch quoted above. The Hacienda Jaral de Berrio appears on the map of the state of Guanajuato in the *Atlas Geográfico de la República Mexicana.* This place is situated in the extreme northern edge of the state, about 50 Km. south of the city of San Luis Potosí and about 325 Km. northwest of México, D. F.

It is very clear from these sources that Schumann spent a great deal of time at a place called Jaral in the vicinity of Mexico, D. F., and it is reasonable to assume that had he also collected at another Jaral (or Jarral) in Coahuila, he would have indicated that fact on his labels. Also, the plants he collected consist of a relatively high percentage of species well known in the south and in the mesic habitats of the high Sierra Madre (both eastern and western) which have never been known in the desert region of southern Coahuila (exclusive of the high moutainous Saltillo area). Their presence there would be contrary to the nature of the species as indicated by their known habitats. The location of Jaral in Guanajuato near Mexico, D. F., therefore explains several instances of strangely disjunct and disharmonious ranges published by various authors.

Division of Plant Exploration and Introduction,
Bureau of Plant Industry, Washington, D. C.

The Ferns and Lycosphens of Pennsylvania

EDGAR T. WHERRY

In Porter's Catalogue of the Bryophyta and Pteridophyta found in Pennsylvania,[1] published in 1904, there were listed in the latter group 75 species and 10 varieties. Five years later a 19-page article by Poyser[2] on the Fern Flora of the State appeared, and in this 15 additional subspecies, varieties, forms, and hybrids were included. During the succeeding 33 years so many further finds have been made that a new summary seems desirable. At the same time, certain taxonomic and nomenclatorial novelties may be placed on record.

First of all, the second term used in the caption of this article needs explanation. Modern morphological and anatomical research (cf. Eames[3]) has shown the classic group *Pteridophyta* to be so unnatural that its abandonment is called for. The members of it generally known as the Fern-allies prove to be less closely allied to the ferns than are the latter to the seed-plants. Actually, vascular plants are divisible into four major groups: PSILOPSIDA (including *Psilotum*); LYCOPSIDA (*Lycopodium, Selaginella*, and *Isoetes*); SPHENOPSIDA (*Equisetum*); and PTEROPSIDA, the ferns plus the flowering plants. Ignoring the first of these as relatively unimportant, the initial syllables of the second and third groups are here combined to produce, as a synonym of "fern-ally," the new term **Lycosphen.**

While in many respects the Lycosphens are more primitive than the Ferns, the latter group is so much more important that it will be discussed first. In accordance with modern views as to evolutionary relationships, however, the Eusporangiate Grapeferns[4] are taken up before the Leptosporangiates.

The writer's interpretations of infraspecific categories are:

SUBSPECIES, abbreviated to ssp. Applicable in cases where the plants are decidedly different morphologically and / or geographically.

VARIETY, abbreviated to v. Used when the morphologic and geographic differences are of minor significance.

FORM, abbreviated to f. Used for variants in which the morphologic features involved are trivial and superficial, and there is no geographic segregation whatever.

---

[1] Ginn & Co., Boston, 1904.

[2] Fern Bull. 17: 65, 1909.

[3] Morph. Vasc. Plts., Lower Gr. McGraw-Hill, N. Y., 1936.

[4] Common names mostly as in Stand. Pl. Names, Ed. 2: 223, 1942.

Nomenclatorial-Taxonomic Discussion

Botrychium multifidum (Gmel.) Rupr. A comprehensive species, divided by Clausen[1] into five subspecies, two of which occur in Pennsylvania and are here classed as varieties:

B. multifidum v. *intermedium* (Eat.) Farw. The earliest name in varietal status for the larger and more widespread representative of the species in the state. It grades into:

B. multifidum **v. typicum** (Claus.) W., stat. nov. *B. m.* ssp. *typicum* Clausen.[1] This differs only in its lesser size at maturity and the greater compactness of its segments. Such differences seeming too unimportant to constitute subspecies distinctness, varietal status is proposed.

B. obliquum Muhl. ex Willd. In the writer's Guide to Eastern Ferns the typical representative of *B. obliquum* was termed v. *pennsylvanicum* in accordance with Article 16 of the International Rules of Botanical Nomenclature of 1930. Further study of the matter has indicated, however, that Recommendation XVIII of these rules, although made only for *new* epithets, should be followed in *all* cases in naming the typical representative of any species in an infraspecific category. Accordingly the original *Botrychium obliquum* Muhl. ex Willd.[2] may be known, when varieties are under discussion, as v. **typicum** W., nom. nov.

Some authors make the Eastern Grapefern a subspecies, variety, or form of *B. dissectum* Spreng., but since in the majority of cases the two are entirely distinct in aspect, their maintenance as independent species is favored here. They exhibit partial geographic segregation, in that southward there are many colonies showing only the obliquum, and northwestward some showing only the dissectum, type of cutting. Intermediates between them, the existence of which has led to confusion as to their independence, may occur in any colony of *B. obliquum*; these appear to represent mutants of that similar to one which in some past geological period started a line of descent which culminated in *B. dissectum.* They have actually been observed to develop by Tryon[3] (whose interpretation was, however, quite different from that here favored). The original crenulate-margined form of the species may be designated *B. obliquum* f. **typicum** W., nom. nov. The variant may then be known as:

Botrychium obliquum f. **confusum** W., nova. Margins more or less distinctly dentate, but the teeth not definitely linear, as they are in *B. dissectum.* (Margine plus minusve dentato, dentibus vix linearibus.) Type in herbarium Academy Natural Sciences Philadelphia, collected by the writer August 29, 1941, in weedy thicket on old field north of Bowmans Hill, Bucks Co., Pennsylvania.

[1] Mem. Torr. Bot. Club **19(2)**: 26, 1938.

[2] Sp. Pl. **5**: 63, 1810.

[3] Amer. Fern Jour. **26**: 26, 1936.

Botrychium obliquum v. *oneidense* (Gilb.) Waters. This has been made by various authors a distinct species, a variety of *B. dissectum, B. multifidum, B. obliquum,* or *B. ternatum,* or a form of some of these. It actually lies intermediate between the presumably ancestral *B. multifidum* and the derivative *B. obliquum.* Some individuals of it occur in colonies of the former, and evidently represent mutants of that similar to the one which in some geological time started the line of descent which culminated in the present-day *B. obliquum*; while others appear in colonies of the latter species, often far south of the range of *B. multifidum,* and are to be regarded as a sort of throwback to an ancestral condition. Separate names for the plants of these respective origins would be desirable; but since they seem indistinguishable morphologically, and since collectors rarely record on their labels with which species their specimens were associated, this would be impracticable. The earlier of the two combinations of the names concerned is accordingly accepted here.

B. lanceolatum v. *angustisegmentum* Pease & Moore. This plant was raised to species rank by Fernald, and given the intermediate status of ssp. by Clausen. The differences between it and the original *B. lanceolatum* are, however, of minor significance, so it is here kept in varietal status.

B. simplex v. *typicum* Clausen. Following Article 16 of the Rules, the writer[1] termed this plant "v. *cordatum.*" In accordance with Rec. XVIII Clausen named it v. *typicum,* and he is now followed.

B. virginianum v. **typicum** (Claus.) W., stat. nov. *B. v.* ssp. *typicum* Clausen.[2] The differences between our plant and the boreal one seem too slight to justify their subspecific segregation, so a reduction to varietal status is favored. In the Guide to Eastern Ferns, Art. 16 was followed and "v. *intermedium*" was used; Rec. XVIII calls, however, for the epithet "*typicum.*"

Ophioglossum vulgatum L.[3] Fernald[4] has recently recognized two varieties of this plant in eastern North America. The differences between them are rather inconstant, but they can not be classed as mere forms because they have geographic differences: one is dominantly northern, growing in open acid-soil situations and fruiting late; the other dominantly southern, in shaded circumneutral soils and fruiting early. They are accordingly accepted as varietally distinct. There seem to be no essential differences, however, between the northern one and the original European plant, so following Rec. XVIII this may be designated:

O. vulgatum v. **typicum** W., nom. nov. *O. v.* v. *pseudopodum* (Blake) Farw. The commoner variety in Pennsylvania, although *O. v.* v. *pycnostichum* Fern. occurs along our southern borders.

---

[1] Am. Fern Jour. **27**: 58, 1937.

[2] Mem. Torr. Bot. Club 19(2): 98, 1938.

[3] Sp. Pl.: 1062, 1753.

[4] Rhodora **41**: 494, 1939.

Pteridium aquilinum v. *latiusculum* (Desv.) Underw. ex Hlr. In recent years American fern students have tended to classify our common eastern Bracken as a distinct species, *P. latiusculum*. As pointed out by Tryon,[1] however, the differences involved are of no more than varietal rank.

Pteridium aquilinum v. *pseudocaudatum* Clute. The original combination for this variety, which barely enters Pennsylvania.

Athyrium asplenioides (Michx.) Eat. **v. typicum** (Butt.) W., status novus. The original *Nephrodium asplenioides* Michx.[2] *A. a.* f. *typicum* Butters.[3] The two forms recognized by Butters seem to differ sufficiently to deserve varietal rank.

Athyrium asplenioides **v. subtripinnatum** (Butt.) W., status novus. *A. a.* f. *subtripinnatum* Butters.[3] This high-altitude representative of the species does not merely occur sporadically in colonies of v. *typicum*, as a form would do, but in independent colonies. It was informally raised to varietal status by the writer[4] in 1923, and is now so treated again, with literature-citation.

Asplenium platyneuron (L). Oakes ex Eat.[5] **v. typicum** W., nomen novum. The original *Acrostichum platyneuros* L. as generally interpreted. It requires a varietal epithet for comparison with the following:

Asplenium platyneuron v. *incisum* (Howe) Robinson.[6] The first name in varietal status for the representative of the species with deeply cut margins, but normal sori. Essentially the same plant was later named *A. ebeneum* v. *bacculum-rubrum Featherman*,[7] *A. e.* v. *serratum* Miller,[8] and *A. pl.* v. *euroaustrinum* Fernald.[9] So long as this plant was known only as a sporadic mutant in the midst of normal colonies, its status could well have been considered that of a mere form; but now that it is known to be dominant over considerable areas of the Atlantic Coastal Plain, it is preferably treated as a variety.

Asplenium platyneuron v. **hortonae** (Dav.) W., comb. nov.; *A. ebeneum* v. *hortonae* Davenport.[10] The assignment of this plant to varietal status is often erroneously attributed to Clute,[11] but he expressly used the term form; it was called a variety, but informally and without references, by Rugg.[12] This has been confused with v. *incisum*, but differs from that in being completely sterile, and being cut in a different pattern. Even though because of this sterility it cannot show any geographic segregation, it may well be classed as another variety, in view of its striking morphologic distinctness.

---

[1] Rhodora **43**: 1, 1941.

[2] Fl. Bor. Amer. **2**: 268, 1803.

[3] Rhodora **19**: 190, 1917.

[4] Amer. Fern Jour. **13**: 105, 1923.

[5] Ferns N. Am. **1**: 24, 1878.

[6] Rhodora **10**: 29, 1908.

[7] Rept. Bot. S. La. **1870**: 75, 1871.

[8] Bull. Torr. Bot. Club **4**: 41, 1873.

[9] Rhodora **37**: 382, 1935.

[10] Rhodora **3**: 1, 1922.

[11] Fern Bull. **14**: 86, 1906.

[12] Am. Fern Jour. **24**: 84, 1934.

Asplenium ruta-muraria L. v. **cryptolepis** (Fern.) W., status novus. *A. cryptolepis* Fernald.[1] *A. r-m.* v. *cryptolepis* Christensen[2] (non-valid because not accompanied by discussion); Massey[3] (still less valid in that neither literature citation nor discussion are given). *A. r-m.* ssp. *cryptolepis* Clausen & Wahl.[4] The differences between the European and the American plants pointed out by Fernald are constant when one compares specimens from porous stone walls in the moist atmosphere of the former region with those from solid limestone cliffs in our dryer climate. However when colonies of our wall-rue growing in moist masonry are examined, they are scarcely distinguishable from European plants. The American plant is accordingly considered to deserve at most varietal rank. Since two earlier attempts to assign it to this are apparently non-valid, under the rules of nomenclature, validation is here undertaken.

A. ruta-muraria v. **ohionis** (Fern.) W., comb. nov. *A. cryptolepis* v. *ohionis* Fernald.[5] *A. ruta-muraria* v. *lanceolum* Farwell,[6] not Christ. This variant would be accorded only the status of form, were it not that it locally forms independent colonies. It is here newly reported from Pennsylvania.

× *Dryopteris* **slossonae** (Hahne) W., comb. nov. *Nephrodium slossonae* Hahne.[7] = *D. cristata* × *D. marginalis.* When hybrids between species-pairs are of frequent occurrence, it is convenient to have quasi-specific designations for them. The above transfer is accordingly proposed.

Currania dryopteris. Linnaeus[8] placed the Oak-ferns as well as the Beech-ferns in the genus *Polypodium.* In 1851 Newman[9] created a genus *Gymnocarpium,* and two years later Fée[10] proposed *Phegopteris,* to include both of these groups. Subsequent name-shifters have referred them to at least six other genera.

In 1909 Copeland[11] published for an Asiatic fern possessing the jointed lower pinna-stalks of the Oak-ferns the genus name *Currania.* When Ching[12] in 1933 urged the generic distinctness of the two groups, he resurrected the long-overlooked *Gymnocarpium,* and restricted it to the Oak-fern group alone. Since Copeland's name had already been applied to a member of this group, the rules of nomenclature require its use if generic status is accepted. I therefore propose that *Polypodium dryopteris* L.[13] be replaced by: *Currania* **dryopteris** (L.) W., comb. nov. The Limestone Oak-fern, originally named *Polypodium robertianum* Hoffm.,[14] will correspondingly become: *Currania* **robertiana** (Hoffm.) W., comb. nov.

---

[1] Rhodora **30**: 41, 1928.

[2] Index Filicum, Suppl.

[3] Claytonia **2**: 34, 1935.

[4] Rhodora **41**: 29, 1939.

[5] Rhodora **30**: 43, 1928.

[6] Am. Midl. Nat. **12**: 273, 1931.

[7] Allg. Bot. Ztg. **10**: 103, 1904.

[8] Sp. Pl.: 1089, 1093, 1753.

[9] Phytologist **4**: 371, 1851.

[10] Gen. Fil: 243, 1853.

[11] Phil. Jour. Sci. Bot. **4**: 112, 1909.

[12] Contr. S. S. China, Bot. **9**: 30, 1933.

[13] Sp. Pl.: 1093, 1753.

[14] Deutsch. Fl. **2**: 20, 1795.

Lycopodium selago L.,[1] v. **typicum** W., nomen novum. In accordance with article 16, the original representative of this Clubmoss was termed in the writer's Guide to Eastern Ferns[2] var. *appressum* Desv. Under Recommendation XVIII, however, it requires a different designation.

Lycopodium obscurum L.,[1] v. **genuinum** W., nomen novum. While this combination was made in the Guide[3] no literature citation was there given, so that it might be considered non-valid. Formal proposal is therefore made here.

Geographic Treatment

OPHIOGLOSSACEAE

BOTRYCHIUM

B. multifidum v. *intermedium.* None of the varieties of the circumboreal Broadleaf Grapefern were included in Porter's or Poyser's lists, two collections of the present variety being overlooked: near Erie by Guttenberg in 1882 and in Monroe County by Harshberger in 1904. We now know it in 8 counties: Berks, Erie, Lackawanna, Monroe, Pike, Sullivan, Susquehanna, and Wayne. Localities in the first-named county represent its southernmost occurrences in the eastern United States, latitude 40° 32′.

B. multifidum v. *typicum.* This variety was not recognized in the state until 1938, when it was collected by Dix.[4] It has been found thus far only at a few points in Wayne and Susquehanna counties, its southern limit being in the latter at 41° 50′. However, intermediates between it and the preceding variety occur as far south as Lackawanna.

B. obliquum v. *oneidense.* No mention of this plant was made by Porter or Poyser, and its occurrence in the state was first pointed out by Graves[5] in 1935. Three years later it was recorded by Clausen[6] from 6 counties, and is now known from 20, scattered throughout.

B. obliquum v. & f. *typicum.* This species, for which the common name Eastern Grapefern is suggested, was collected in Pennsylvania by Muhlenberg and sent to Europe for naming, being given the accepted epithet by Willdenow[7] in 1810. Its type locality may be presumed to have been Lancaster, where Muhlenberg lived. There are 60 county records from all parts of the state.

---

[1] Sp. Pl.: 1102, 1753.

[2] Guide East. Ferns: 161, 1937.

[3] Ibid.: 173, 1937.

[4] Amer. Fern Jour. **29**: 19, 1939.

[5] Amer. Fern Jour. **25**: 110, 1935.

[6] Mem. Torr. Bot. Club **19(2)**: 50, 1938.

[7] Sp. Pl. **5**: 63, 1810.

The common form of the Eastern Grapefern, *Botrychium obliquum*, has more or less oblong pinnules; but in juvenile and sometimes in mature individuals they may broaden and become ovate to deltoid. Such plants were named by Graves[1] var. *pennsylvanicum*, the type specimen being from Morrisville, Bucks County. Clausen[2] held that " This is the weakest of the named leaf forms of the *B. dissectum* complex and certainly does not merit the rank of variety or even of form."

B. obliquum f. *confusum*. This is the form the existence of which has led many authors to class *B. obliquum* and *B. dissectum* as conspecific; but it is here considered too rare to justify this. The name was given on an earlier page on the basis of a specimen collected in Bucks County. Similar material is represented in herbaria also from Greene, Luzerne, Philadelphia, and Susquehanna counties.

B. dissectum. The Cutleaf Grapefern, readily distinguished by its dentate type of cutting, has been collected in only ⅔ as many counties as the crenate-serrate margined *B. obliquum*, with which it is usually associated.

B. lanceolatum v. *angustisegmentum*. Although once supposed, as stated by Poyser, to be " confined to the mountain belt," the circumboreal Triangle Grapefern is now known to occur also in the lowlands, down to Chester and Lancaster, making 27 counties in all.

B. matricariaefolium. Earlier compilers used for the Daisyleaf Grapefern the names *B. neglectum* and *B. ramosum*, neither valid. Though like the next-preceding attributed by Poyser to the " mountains and northern portion " of the state, it is now known to occur throughout, having been collected in at least 50 counties, down to sea-level in Philadelphia. Both f. *gracile* and f. *palmatum* are included.

B. simplex v. *typicum*. There are but two records of Dwarf Grapefern for Monroe county and one each for Northampton and Wayne. The occurrence near Easton, Northampton County, represents its southern limit in the eastern United States, latitude 40° 42′, except for a possible representative of the v. *compositum* from Berks County.

B. simplex v. *tenebrosum*. This smallest of the grapeferns, with its sterile segment borne especially high, has been classed as an independent species, but grades too freely into the admitted varieties of *B. simplex* to be so maintained. It was first reported in Pennsylvania by Poyser on the basis of a single plant collected in Lehigh county, and has since been found also in Berks, Bucks, Dauphin, Philadelphia, Pike, Warren, and Wayne. The Philadelphia station represents its southern limit, latitude 40° 3′. The juvenile state known as f. *simplicissimum*, with tiny entire sterile segment, is frequent.

---

[1] Amer. Fern Jour. **25**: 118, 1935.

[2] Mem. Torr. Bot. Club **19(2)**: 51, 1938.

Botrychium simplex v. *laxifolium.* The representative of the species bearing a relatively large sterile segment about the middle of the aerial stem remained without a name until 1937, when Clausen proposed for it v. *laxifolium.* This rare eastern variety has been found thus far in Berks, Bucks, Lycoming, Philadelphia, and Sullivan counties. Its western range-limit is the Lycoming station, longitude 76° 54′, and its southern the Philadelphia one, latitude 40° 3′.

Botrychium virginianum v. *typicum.* Rattlesnakefern is one of Pennsylvania's commonest, occurring in every county. It sometimes fruits while still small, and is then known as f. *gracile*; this is often seen here.

OPHIOGLOSSUM

O. vulgatum v. *typicum.* The widespread eastern representative of this species, essentially the same as the original European one, is represented in herbaria from 30 Pennsylvania counties. The most luxuriant colony seen is at the margin of an ancient alluvial terrace of the Schuylkill river, west from Schuylkill Haven. Here the adderstongues grow by hundreds, not only in the humus-rich loamy soil of the flats, but also well up under the Rhododendron bushes of the hill-slope. A growth form resulting from crowding by other plants, with the sterile segment to 20 cm. long and but 2 cm. wide, named f. *lanceolatum,* came from Delaware county.

O. vulgatum v. *pycnostichum.* When this endemic was segregated by Fernald in 1939 it was not recognized to grow north of Montgomery county, Maryland. Study of herbarium sheets from Pennsylvania has now shown, however, that it ranges into our more southern counties, there being unmistakable material with the subcordate sterile segment and ellipsoidal sporangia from Delaware, Lancaster and Montgomery, and plants intermediate between the two varieties from Dauphin, Franklin, and Perry counties.

OSMUNDACEAE

OSMUNDA

O. regalis v. *spectabilis.* Rarest of the three Osmundas of the state, Royalfern has been collected in but 55 counties, in some only once.

O. claytoniana v. *vera.* Growing in drier and richer soil than the other two, the Interrupted-fern is very conspicuous in Pennsylvania, and has been collected in every county but Washington. Forma *dubia,* with spaced pinnules, is reported from Monroe county.

O. cinnamomea v. *typica.* Cinnamonfern is common in sterile swamps throughout the state, and is represented in herbaria from all but three counties. Several of its named forms are of interest here.

Osmunda cinnamomea f. *auriculata.* Known in Lancaster and Wayne.

O. cinnamomea f. *bipinnatifida.* This form with obtusely lobed segments is recorded from Berks, Lancaster, Tioga and Wayne counties.

O. c. f. *cornucopiaefolia.* A form with the lobe-midveins more or less bare terminally and bearing medially funnel-shaped outgrowths has been known thus far only from the original northern Ohio station. A specimen matching the original in all respects was collected by Frank Bell ½ mile northeast of Chalk Hill, Fayette County, in 1939. Subsequent search through the myriads of plants growing there has failed to relocate the one which bore this frond.

(*O. c.* f. *crenulata.* Described from Wayne County; a mere juvenile f.)

O. c. f. *frondosa.* Forms with the fertile fronds bearing more or less sterile tissue may occur in almost any large colony.

O. c. f. *glandulosa.* Originally described both as a variety and a form, the representative of the species with glandular pubescence deserves only the latter status. The single known Pennsylvania collection is from Little Gap on the Carbon-Northampton line at an altitude of 1100 feet.

O. c. f. *incisa.* Plants with the segments acutely lobed have been found in Berks, Sullivan, and Wayne counties.

O. c. f. *latipinnula.* A form with the segments abnormally broad and few, recorded by Gruber[1] from two Berks County stations.

SCHIZAEACEAE

Lygodium

L. palmatum. Pennsylvania may have been the source of the original introduction of this Climbingfern to science; for when Bernhardi announced it in 1801 under the name *Gisopteris palmata* he stated it to have been first recognized by Willdenow, who in turn recorded that it had been received from Muhlenberg. Unfortuntaely the latter never published any data as to where he found it. Rare though locally abundant, it yields an attractive effect as it twines over the bushes in moist, acid swamps. Leaving out supposed records from Lehigh and Philadelphia counties, which are wholly unauthenticated, it is known to grow in the following, all eastern: Bucks, Carbon, Lackawanna, Luzerne, Monroe, Schuylkill, Sullivan (western limit, longitude 76° 20′), Wayne and Wyoming.

MARSILEACEAE

Marsilea

M. quadrifolia. This native of Europe has locally escaped from cultivation in Pennsylvania ponds, in Delaware and Monroe counties.

---

[1] Amer. Fern Jour. **30**: 46, 1940.

DICKSONIACEAE

DENNSTAEDTIA

D. punctilobula. Hayscented-fern prefers sterile acid soil and is common only in areas underlain by gneiss or sandstone, but has been collected in every county of Pennsylvania. Plants with crested pinnae, known as f. *cristata,* are occasionally found.

POLYPODIACEAE: PTERIS SUBF.

PTERIDIUM

P. aquilinum v. *latiusculum.* Eastern Bracken, now regarded as a variety of a world-wide species, also grows chiefly in sterile acid soils. Occurring throughout the state, it has been collected in every county but Washington.

P. aquilinum v. *pseudocaudatum.* The material reported under this name from Delaware and Lehigh counties seems to represent an anomalous development of the widespread variety rather than this southern one.

POLYPODIACEAE: ADIANTUM SUBF.

ADIANTUM

A. pedatum v. *originarium.* The attractive Northern Maidenhair grows in woodlands in all parts of Pennsylvania, and is represented in herbaria from all but two counties. Reports of the Southern Maidenhair in the state are based on immature fronds of the northern one.

CRYPTOGRAMMA

C. stelleri. Until recently the circumboreal Slender Rockbrake was supposed to reach its southeastern limit in Pennsylvania, but it is now known further south, in West Virginia. Poyser stated it—as *Pellaea gracilis*—to grow on limestone which it does in many places; however, in Pennsylvania it occurs only on north-facing cliffs of shale with calcareous water oozing from the crevices. Very rare, it was known to Porter from but a single rock, and even now has only two or three stations each in Lycoming, Sullivan, and Wayne counties. The most accessible is at Lincoln Falls, near Estella P. O.

PELLAEA

P. atropurpurea. Hairy Cliffbrake is known in all Pennsylvania counties in which there are extensive limestone outcrops, and in a few where such rocks are but poorly developed, the total number being 32.

Pellaea glabella. Though named as early as 1869, this species has been generally overlooked, and was not mentioned by Porter or Poyser; certain of their records of *P. atropurpurea* prove, however, to have represented the Smooth Cliffbrake instead. The earliest collection in the state was made at the soapstone quarry on the Montgomery-Philadelphia county line near the present Miquon by A. H. Smith in July, 1861. It is now known on bleak cliffs or walls of limestone and other highly calcareous rocks in at least 14 counties: Berks, Bucks, Centre, Chester, Cumberland, Dauphin, Huntingdon, Lancaster, Lehigh, Montgomery, Northampton, Perry, Philadelphia, and York.

Cheilanthes

C. lanosa. Hairy Lipfern was well-known to Porter, and was listed by Poyser, under the name *Ch. vestita,* from 9 eastern counties. Subsequent exploration has disclosed its wider occurrence, the total number of counties to date being 20, but it is evidently absent from the northern half of the state.

POLYPODIACEAE: WOODSIA SUBF.

Woodsia

W. ilvensis. Rusty Cliff-fern has long been known in the state and was listed by Porter and Poyser from 8 or 9 eastern counties. At present the list stands at 24, all east of longitude 79°. In Bedford and Fulton counties the plants are decidedly less pubescent than those occurring farther northeast, and might well be named as a distinct form.

W. obtusa. In contrast with its relative, the Eastern Cliff-fern is one of the commoner species of the state, although becoming rare toward the northwest corner. Herbarium specimens are preserved from at least 50 counties. Its type locality is believed to have been Lancaster County, from which it was sent to Europe by Muhlenberg.

POLYPODIACEAE: ONOCLEA SUBF.

Pteretis

Pt. nodulosa. Ostrichfern has been variously placed in the genera *Matteucia, Onoclea,* and *Struthiopteris,* but current American usage is here followed. It grows locally, chiefly on alluvial flats, nearly throughout Pennsylvania, although the few colonies reported toward the southeast corner appear to represent escapes from cultivation. Porter knew it from 11 counties, but by the present time the list has increased to 38.

ONOCLEA

O. sensibilis v. *genuina.* One of the commonest species of Pennsylvania, Sensitivefern or Beadfern has been collected in every one of the 67 counties. As is the case with many dimorphic ferns, it shows occasional intermediates between fertile and sterile fronds, a state known as f. *obtusilobata.* This has actually been collected in 13 counties, but may appear in any colony. Sometimes the development of such freaks is the result of injury to the plants before the fertile fronds come up in late summer, but material seen in an undisturbed Rhododendron swamp in Wayne County showed no evidence of such a source. A variant of this having the fronds sterile down one side and fertile down the other, known as f. *hemiphyllodes,* has been reported here also.

The frond of the Beadfern is cut into oblong lobes with more or less undulate margins, the projections varying from obtuse to acute. Plants from near Kutztown, Berks County, showing extreme development of the latter, have been named f. *acutisegmenta* Gruber.[1]

POLYPODIACEAE: BLECHNUM SUBF.

WOODWARDIA

W. virginica. Some workers have assigned the Eastern Chainfern to a monotypic genus *Anchistea,* and this usage was followed in the writer's Guide to Eastern Ferns. Because the differences in veining on which this segregation was based are after all rather slight, reunion with the genus *Woodwardia* is now favored. Porter and Poyser knew this fern from only 7 counties, but subsequent collecting has increased the known number to 19.

LORINSERIA

L. areolata. In this case assignment to a monotypic genus seems justified by the net-veining and the dimorphism of the fronds. Previous compilers listed Dwarf Chainfern—as a *Woodwardia*—for 3 counties, but the present list is: Adams, Berks, Bucks, Chester, Delaware, Lancaster, Lehigh, Monroe, and Pike, 9 in all.

POLYPODIACEAE: ASPLENIUM SUBF.

CYSTOPTERIS

C. bulbifera. Bulblet Bladderfern was listed by Porter—as a *Filix*—for 8 counties, and was accidentally omitted from Poyser's article. Although rather local, it is now known from 35, scattered throughout the state.

---

[1] Amer. Fern Jour. **30**: 46, 1940.

Cystopteris fragilis. Brittle Bladderfern, characterized by Christensen[1] as "the most widely distributed of all ferns" is separable into a number of varieties, of which four appear to occur in Pennsylvania:

C. f. v. *genuina.* The common circumboreal representative of the species occupies moist sheltered rock crevices. In his Index, Broun[2] recorded it as extending south to Pike County, but recent study of herbarium material and collecting trips have shown it to be rather widespread in the state. It reaches a southeastern limit at Moselem, Berks County, latitude 40° 30′, but in the Appalachian Plateau extends south to the state line in Somerset; and the total county list now stands at 16.

C. f. v. *laurentiana.*(?) The relative of the next-preceding with glandular indusia has been recorded heretofore only from the St. Lawrence valley region and from Bruce peninsula, Ontario. In the Spring of 1941 Professor Gruber of Fleetwood guided the writer to cliffs of calcareous shale at Moselem, Berks County, and there a small collection of specimens believed to be v. *genuina* was made. When these were subsequently examined under the microscope, a few fronds were found to have glandular indusia, and so may represent the present variety instead. Further study of this and other possible occurrences is in order.

C. f. v. *mackayii.* This is the representative of the species which corresponds to Poyser's characterization, "common throughout Pennsylvania." It grows in circumneutral or moderately acid soil in rock crevices, usually well-shaded. There are 55 county records.

Locally, especially southwestward, colonies occur in which the pinnules are intermediate between the ovate, stalked, dentate ones of v. *genuina* and the obovate, sessile, rounded ones of v. *mackayii*; while the indusia on one and the same frond have in part the long frayed tip characteristic of the former and in part the truncate entire distal margin of the latter. How such intermediates are to be classified has not as yet been decided.

C. f. v. *protrusa.* Unlike the other varieties, this a plant of slopes and alluvial flats where the soil is loose and rich in humus. It is well characterized by its long creeping rootstock, the tip of which extends, during the growing season, several centimeters beyond the cluster of fronds of the year. Being a southern plant, it enters Pennsylvania from that side, as is developed chiefly in the more southern counties, although there is a remarkable disjunct occurrence near Montoursville, lat. 41° 16′. Thus far it is known to have been collected in 16 counties. Apparent intermediates between this and v. *mackayii* have been found locally, but their significance is not understood.

---

[1] Verdoorn's Man. Pteridology: 542, 1938.

[2] Index N. Amer. Ferns: 56, 1938.

ASPLENIUM

A. trichomanes. Porter listed the circumboreal Maidenhair Spleenwort from 14 counties, while Poyser termed it "common throughout." The present list numbers 50, but lacks many northwestern counties.

A. resiliens. Blackstem Spleenwort, distinguished from the preceding by its larger size and opposite oblong auriculate pinnae, was long supposed to reach its northern limit in central Virginia. After extensive search in limestone areas, it was found successively in northeastern West Virginia, Maryland, and finally Franklin County, Pennsylvania, latitude 39° 47′, a single colony of a dozen plants.

A. platyneuron. In place of the book-name Ebony Spleenwort the descriptive term Brownstem Spleenwort is here preferred for this, our commonest species. It differs from the next-preceding in its dimorphism and mostly alternate, elongate pinnae. Porter listed it from only 10 counties, while Poyser classed it—under the name *A. ebeneum*—as "common throughout." It is unknown, however, from a number of northwestern counties, the list numbering 58 to date.

In v. *typicum* the pinna-margins are finely serrulate, but now and then the teeth become prominent, giving rise to v. *incisum* ("*serratum*"); this is especially well developed in Lancaster County, but is known in several others. The variant in which all the fronds are sterile and have laciniate margins, v. *hortonae*, has been found once each in Lancaster and York. These two counties have also yielded fronds with tiny plants growing from the rachis, f. *proliferum*.

A. bradleyi. Cliff Spleenwort is often stated in books to grow on limestone, but this is an error, as it is actually restricted to rocks such as sandstone and gneiss where the soils have become intensely acid. One of the state's rarities, this fern was recorded by Porter only from Lancaster County; Poyser added York, and Pretz[1] Carbon.

A. ruta-muraria v. *cryptolepis.* When he proposed the setting off of the American representative as a distinct species, Fernald[2] stated that it "is rarely, if ever, found on brick or stone-walls," the European plant, as its name implies, being common in such situations. It was known—on limestone—to Porter in 8, Poyser in 10, and at present in 22 counties, chiefly southern and eastern. I have seen it on masonry in Berks, Bucks and Lebanon counties (and in other states too).

The variant with acutish pinnules, named v. *ohionis* and heretofore recorded only from Ohio, has now been discovered to occur in Pennsylvania also, specimens being preserved from Bucks, Huntingdon, Lehigh, and Northampton counties.

---

[1] Amer. Fern Jour. 1: 137, 1911.

[2] Rhodora 30: 37, 1928.

Asplenium montanum. The attractively cut Mountain Spleenwort is found in acid-soil situations on rock ledges in our southern and eastern counties, Porter's list numbering 8, Poyser's 11, and the present 20. In York County there occur forms with unusually slender segments, which deserve some taxonomic recognition.

A. trudelli. This fern, for which the common name Pinnate Spleenwort has been suggested, was long confused with the Lobed Spleenwort, but was segregated by the writer[1] in 1925, the type locality being Cully, Lancaster County, Pennsylvania. While it may have originated as a hybrid between *A. montanum* and *A. pinnatifidum,* it now reproduces itself and may be regarded as having attained species status. Very rare, it is known at one or two stations each in Chester, Fayette, Lancaster, and York counties.

A. pinnatifidum. Lobed Spleenwort was discovered in Lancaster County by Muhlenberg; he classed it as a variety of the Walkingfern. Porter knew it from but 3, Poyser from 5, counties, the present list being: Adams, Berks (northern limit, latitude 40° 20′), Chester, (Delaware?), Fayette, Greene, Lancaster, Philadelphia, Washington, and York.

(*A. fontanum,* given to Porter by an amateur, as collected in Pennsylvania, had presumably been obtained by exchange from Europe.)

Asplenium hybrids. There are four species crosses which have apparently not developed to the point of being able to reproduce themselves:

A. platyneuron × *trichomanes* (× *A. virginicum* Maxon). A specimen found at Delaware Water Gap, Monroe County, many years ago, is preserved in the Brown University herbarium.

A. bradleyi × *platyneuron.* A sheet bearing four plants is in the herbarium of the Academy of Natural Sciences of Philadelphia, having been collected along the Susquehanna river near McCall's Ferry. Whether the station was in Lancaster or in York County is not certain, but at any rate it has now been inundated by back-water from a dam.

A. bradleyi × *montanum.* A single small plant appeared and grew for a few years in Tucquan glen, Lancaster County. Much better material of this cross grows on a cliff in Warren County, New Jersey.

A. bradleyi × *pinnatifidum.* (× *A. gravesii* Maxon). Several plants of this were collected in Lancaster and York counties years ago, but none have been found recently. Its northern range-limit is here.

ASPLENOSORUS

× *A. ebenoides.* Walking Spleenwort, a notable bigeneric hybrid (between the very dissimilar *Asplenium platyneuron* and *Camptosorus rhizophyllus*) was discovered by R. R. Scott in 1864 along the Schuylkill river in Montgomery county. It was known to Porter in 2, to Poyser in 8, and at present in 13 counties.

---

[1] Amer. Fern Jour. 19: 49, 1925.

CAMPTOSORUS

C. rhizophyllus. While as well known the Walkingfern grows most luxuriantly on limestone, it occurs in Pennsylvania on many other rocks as well, though usually where the soil has become circumneutral. There are 56 county records. The very narrow *f. angustatus*, f. *auriculatus* with elongate auricles, f. *boycei* with dentate margins, and f. *intermedius* with cuneate base are all known here.

ATHYRIUM

A. pycnocarpum. Known to earlier workers as the " Narrowleaf Spleenwort, *Asplenium angustifolium* ", this fern is now assigned different genus and species epithets, and the common name of Gladefern. Porter knew it from 7 Pennsylvania counties, Poyser from 14, and the present list stands at 25, well distributed over the state.

A. thelypterioides. Here too there have been changes in all the names. Much commoner than its relative, just discussed, Silvery Gladefern (here suggested as a new common name for it) has been collected in 61 out of our 67 counties. Both the acutish lobed f. *acrostichoides* and serrate-lobed f. *serratum* are occasional.

A. angustum. While all the Lady-ferns were formerly grouped together as *Asplenium* or *Athyrium filix-femina,* our present view is that two species of this group are represented in eastern North America. The present one, Northern Ladyfern, has persistent dark brown stipe-scales whose cells show a narrow lumina and thick dark walls; the frond normally widest near the middle; indusia more or less ciliate with the cilia pointed; and spores bright yellow with a minutely granulate surface. Poyser considered that he had found 7 varieties, although Butters [1] recognized only the following 3 in our region:

A. angustum v. *typicum.* Characterized by having the fronds dimorphic, the fertile ones coriaceous, with narrow lobes and sori confluent at maturity, the pinnae not exceeding 12 cm. and entire pinnules 12 mm. in length. Known in 20 counties, mostly northern.

A. angustum v. *elatius.* Similar with the pinnae up to 25 cm. and pinnules to 25 mm. long, the latter pinnatifid. This has been collected in 26 chiefly northern or mountain counties.

A. angustum v. *rubellum.* Fertile and sterile fronds much alike, herbaceous, the lobes relatively broad and the sori remaining discrete; exceedingly variable in size. In spite of the varietal name, this plant does not always have red stipes,—nor do the others always have green ones. One of the commonest ferns of the state, this is represented in herbaria from all but two counties.

---

[1] Rhodora **19**: 188, 1917.

Athyrium asplenioides v. *typicum*. This second eastern segregate from the older comprehensive species is preferably termed the Southern Ladyfern, for it ranges chiefly south of Pennsylvania. From its relative it differs in having deciduous pale-brown stipe-scales with broad pale-walled cells; the frond normally widest near the base; indusia more or less glandular-ciliate; and spores dark brown with a wrinkly or reticulate surface. It is known in about 30 counties, chiefly toward the southern and eastern parts of this state.

An especially large variant, known as v. *subtripinnatum*, has been reported in Pennsylvania, but does not appear to be typically developed here, being more of a southern Appalachian plant.

Although the two recognized species of Ladyfern are rather dissimilar, some Pennsylvania colonies include what appear to be intermediates between them. In these the distinctive characters above enumerated are more or less shuffled, so that, for instance, plants having dark stipe-scales and fronds widest near the middle may nevertheless have glandular-ciliate indusia and brown wrinkly spores. The significance of such relations requires further investigation.

POLYPODIACEAE: DRYOPTERIS SUBF.

DRYOPTERIS

In recent editions of Gray's Manual the bulk of this Subfamily is made a genus and assigned the name *Aspidium*, in Porter's book *Dryopteris*, and in Poyser's *Nephrodium*. Here, following the plan currently favored by the authority C. Christensen[1] the name *Dryopteris* is used, and restricted to the members with short, thick, scaly rhizome, four or more vascular bundles in the stout stipe, firm more or less evergreen fronds, and large sori covered by a thick persistent indusium.

D. intermedia. Though classed in the three works referred to in the preceding paragraph as a mere variety, the Eastern Woodfern is here regarded as a distinct species. Its diagnostic characters comprise an erect or oblique rootstock with the fronds clustered around the tip; scales with more or less dark brown central stripe; firm and wholly evergreen frond-tissue; oblong abruptly-acuminate medial pinnae; sharply serrate lobe-margins; short inner lower pinnules on the basal pinna-pair; and glandular rachis, midveins, and indusia. It was discovered by Muhlenberg in Lancaster County, Pennsylvania; his manuscript name for it, *Aspidium intermedium*, was published by Willdenow in 1810. It grows in humus-rich soil in dry rocky to moist muddy woods throughout the state, having been collected in all 67 counties.

---

[1] Verdoorn's Man. Pteridology: 543, 1938.

Dryopteris spinulosa. The name *D. austriaca* is regarded by some taxonomists as valid for the Toothed Woodfern under present nomenclatorial rules, but until there is general agreement the more widely known name may well be retained. This circumboreal plant differs from the next-preceding species in its oblique to horizontal rootstock bearing the fronds in a short row; light brown scales; membranous frond-tissue which tends to become pale and to wither during autumn, only sterile fronds protected by litter remaining evergreen; deltoid-oblong gradually acuminate medial pinnae; lobe-margins serrate with rather appressed teeth; elongate lower inner pinnules on the basal pinna-pair; and complete absence of glands on the rachis and indusia. In Pennsylvania it is common in swamps and on moist wooded slopes, having been collected in 63 counties.

The intermediates between this and the next-preceding species, the existence of which has led to questioning their distinctness, are here regarded as hybrids. These are like *D. intermedia* in frond-texture and in glandularity, but like *D. spinulosa* in the outline of the medial pinnae. The lower inner pinnules on the lower pinna-pair may be elongate as in *D. spinulosa*, or short as in *D. intermedia.* The name v. *fructuosa* has been applied to the short-pinnuled variant, but seems preferably expanded to cover both, which occur throughout the state.

A plant with the fronds tripinnate at least below, and having the second-order pinnules narrow and remote, has been named v. *concordiana.* One well-marked colony of it is known near Alpine, York County, but specimens from several others approach this type of cutting.

D. campyloptera. Mountain Woodfern was classed as *D.* (or *N.*) *spinulosa* v. *dilatata* by Porter and Poyser, although the valid name for it in varietal status is v. *americana.* Here, however, its species status is accepted. It is a cool-climate fern, growing abundantly on the higher Appalachian mountains, and having spread since the melting of the Wisconsin ice far north into Canada. The erect rootstock has the large deltoid-oblong fronds clustered around its tip; the scales have a dark brown central stripe; the frond tissue is delicate and wholly deciduous during autumn; the frond is 3-pinnate at least below (that of *D. spinulosa* being only 2-pinnate); the lobe-margins are sharply serrate; the lower inner pinnules on the basal pinna-pair are very large, occupying as much space as two pinnules on the upper side of the same pinna, although varying from short to elongate; and there is also variation in glandularity, with many glabrous individuals. Most of the records by Porter and Poyser represented misidentifications, and it is definitely known from but two northern Pennsylvania counties, Bradford and Wayne; cutting and burning of the rocky woodlands where it grows effectively exterminates it, and only the occurrence on Mt. Ararat in the latter county seems still to be in existence.

Dryopteris marginalis. Leather Woodfern is one of the commonest in the state, being able to grow on dry rocky slopes, in open woods, and on hummocks in swamps alike. Its county record is complete. The f. *elegans,* with large segments having lobed margins and the sori " inland ", and f. *traillae,* with acutish, toothed segments are occasional.

× *D. slossonae.* This obvious hybrid between *D. marginalis* and *D. cristata* is occasional in swamps in company with the second-named parent, having been collected in 7 counties. Another hybrid, *D. intermedia* × *marginalis,* is known in Fulton, Lancaster, and Wayne; and *D. marginalis* × *spinulosa* in Berks, Monroe and Northampton.

D. goldiana. Giant Woodfern while not common is occasional in humus-rich woods throughout. Porter knew it from 11 counties, but by now the list is 34. This hybridizes with other members of the genus; under *Nephrodium,* Poyser recorded *D. cristata* × *goldiana* and *D. goldiana* × *spinulosa* from Delaware County. In addition, *D. goldiana* × *marginalis* has been found in Armstrong and Fayette, while both Delaware and Susquehanna have yielded what seems to be *D. clintoniana* × *goldiana,* more or less similar to the plant termed *D. celsa* in Virginia. Further study of all of these hybrids is needed.

D. clintoniana. This name is applied in a comprehensive way to a series of Broad Swampferns which may prove separable when more fully investigated. One accompanies *D. cristata* and differs only in the broader frond-outline and more acuminate pinnae; this is the so-called *D. cristata* v. *clintoniana,* recorded by Porter from 5 and Poyser from 6 counties. Then there are two sorts of plants which grow on moist or even rather dry wooded slopes and have massive fronds with the lowermost pinnae long and pinnate, while the upper ones are decidedly long-acuminate. In one of these, the rootstock scales tend to be pale brown and the sori close to the midveins; this is v. *genuina,* the one on which the species was based. In the other, the scales tend to be dark and shining, while the sori lie about midway between the midveins and the lobe-margins; since it is commoner southward it has been named v. *australis.* Plants approaching *D. cristata* have been seen in herbaria from Berks, Chester, Delaware, Mercer, Montgomery, and Wayne counties. They grade imperceptibly into v. *genuina,* for which the county list is Berks, Bradford, Bucks, Chester, Crawford, Dauphin, Delaware, Huntingdon, Lancaster, Philadelphia, Pike, Sullivan, Tioga, Wayne and York. Plants classed as v. *australis,* and some gradational ones too, are known from Adams, Allegheny, Berks, Bucks, Butler, Dauphin, Lancaster, Mercer, Northampton, and York counties.

Besides the hybrid with *D. goldiana* already mentioned, plants representing *D. clintoniana* × *intermedia* have been found in Pike and Wayne.

Dryopteris cristata. Narrow Swampfern is common in marshes, swamps, and moist woods in all parts of the state, and has been collected in at least 49 counties. Its entrance into hybrids is noted above.

D. boottii. While apparently arising from ancient hybridization between *D. cristata* and *D. intermedia,* this fern is generally regarded as deserving species status. Showing the influence of the second-named parent in profuse glandularity, it may well be termed the Viscid Swampfern. Porter recorded it from 8 counties, and Poyser, under "*Nephrodium cristatum* × *spinulosum intermedium,*" from 12. The list stands at present at 33 counties.

POLYSTICHUM

P. acrostichoides. Commonest fern in the state, Christmasfern has been collected in every county, in some from as many as 25 stations. It grows in a wide variety of habitats, though always rather shady and rich in humus. The following named forms have been recognized among Pennsylvania material: f. *crispum,* with ruffled pinna-margins; f. *gravesii* (type locality in Susquehanna County), with pinna-midribs projecting beyond a truncate apex; f. *incisum,* with the margins more or less deeply toothed; forma *ligulatum,* narrow, type in Berks; f. *multifidum,* with the pinnae pinnatifid to pinnate; and f. *recurvatum* with recurved-tubular pinna-tips.

P. braunii. The circumboreal species here termed Eastern Hollyfern occupies cool ravines and wooded north-facing mountain slopes in three areas: the Ganoga Glen of Kitchen Creek, in northwestern Luzerne; the tributary ravines of the east branch of Fishing Creek, north from Jamison City, in Sullivan just above the Columbia line; and toward both southwestern and northeastern corners of Wayne County. The southern limit of the species range is reached here, there being stations in all 3 counties at latitude 41° 19′. A single plant of the hybrid between the two Polystichums has been collected in southwestern Wayne.

THELYPTERIS

In Gray's Manual, several of the species included here were placed under *Aspidium,* in Porter under *Dryopteris* and in Poyser under *Nephrodium.* Again in agreement with Christensen, the genus epithet *Thelypteris* is now adopted for those with long slender sparsely scaly rhizome, 1 or 2 vascular bundles in the slender stipe, thin deciduous fronds, and small sori covered with delicate evanescent indusia. With them are included two species classed by all three works cited above under the genus *Phegopteris,* these possessing the characters just enumerated, except that the indusia fail to develop at all.

Thelypteris palustris v. *pubescens.* The northeastern representative of the widespread Marshfern grows in marshes and swamps throughout Pennsylvania, having been collected from at least 52 counties. Porter and Poyser listed it as *Dryopteris* and *Nephrodium thelypteris* respectively. When he described the Gulf states relative as v. *haleana,* Fernald[1] mentioned " specimens from . . . southeastern Pennsylvania " as transitional between the two varieties, but they seem to be little more than luxuriant shade forms of v. *pubescens.* Two named forms, f. *frondosa* and f. *serratipinnula* are recorded for Berks County.

T. simulata. Bogfern, a northeast-American endemic, is often confused with the preceding, but can be readily distinguished by its more yellow green color, by the elliptic pinnae, simple veins, and spaced sori. It grows only in intensely acid situations, mostly in hummocks of sphagnum moss. Porter listed it (under *Dryopteris*) from 5 counties, but in two — Chester and Crawford — had misidentified material, as recognized by Poyser (under *Nephrodium*). The present county list comprises: Adams, Berks, Carbon, Centre (western limit, longitude 77° 45′), Franklin, Lackawanna, Lycoming, Monroe, Pike, Schuylkill, Sullivan, and Wayne, 12 in all.

T. noveboracensis. The New York Fern, or Tapering-fern, common and widespread in more or less moist, acid woodlands in eastern North America, has been collected in all 67 Pennsylvania counties. Its sweet-scented f. *fragrans* has been noted in Berks County.

T. phegopteris. The genus *Phegopteris* to which this fern was assigned in earlier works is now believed to be for the most part a minor subdivision of the genus *Thelypteris.* The present species is a circumboreal one, and may well be termed the Northern Beechfern. In Pennsylvania it grows on moist cliffs and cool rocky slopes, scattered through the mountain regions, and locally in the lowlands, descending nearly to sea-level in Philadelphia County. The total county list numbers 35.

T. hexagonoptera. Southern Beechfern was also formerly placed in the genus *Phegopteris.* It is common on wooded slopes in the sourthern part of the state, though rare northward, being represented in herbaria from at least 50 counties.

CURRANIA

C. dryopteris. The nomenclatorial situation in connection with the Oakferns was discussed in the first part of this paper. The present species, for which the common name Woodland Oakfern seems appropriate, is a circumboreal plant. Though rather rare, it occurs in cool rocky woods nearly throughout the state, having been collected in 35 counties, including Philadelphia, where it approaches sea-level.

---

[1] Rhodora **31**: 34, 1929.

Currania robertiana. In Porter's list of Pennsylvania Pteridophytes the rare circumboreal Limestone Oakfern was included, as a *Phegopteris*, from "ERIE, Union City, *Fenno*." Poyser accepted this record without comment. When the ferns in Porter's herbarium were mounted and distributed in the herbarium of the Academy of Natural Sciences of Philadelphia Fenno's specimen came to light, but it proved to be only the commoner Woodland Oakfern.

Late in 1941, however, an authentic occurrence of the Limestone Oakfern was discovered; it is situated in Blair County, between Altoona and Hollidaysburg. This is by far the southernmost station for the species in North America, latitude 40° 28′, the nearest colony known being in Douglas County, Michigan, 450 miles away! The fern grows here at the base of a steep northwest-facing wooded slope, above a brook, the underlying rock being limestone which breaks into small angular blocks, from the crevices of which moisture oozes out, and by evaporation keeps the roots cool. The colony is a small one, and its exact location will be disclosed only to botanists who will agree not to vandalize it.

POLYPODIACEAE: POLYPODIUM SUBF.

POLYPODIUM

P. vulgare v. *virginianum.* Some taxonomists consider the east-American Rockcapfern to be an independent species, and it was listed in the Guide to Eastern Ferns as *P. virginianum.* The differences between it and the original *P. vulgare* are, however, so slight that ours is perhaps best considered a local variety of a wide-ranging circumboreal species. It grows in crevices and on the upper surfaces of rocks of all kinds, and occasionally also on the trunks of trees, often in places too dry and sterile for any other fern to get a foothold. Common throughout the state, it has been collected in all 67 counties.

The typical form of our Rockcapfern is cut into entire linear-oblong segments with a rather obtuse tip. Several variants occur locally in the state, the following having been named under *P. virginianum*: f. *acuminatum* with the segments acutish or acuminate, and undulate-margined; f. *brachypteron*, a very narrow variant, the segments lunate; f. *deltoideum*, the blade more or less deltoid and the lower segments auriculate; f. *bipinnatifidum*, with the segments cut into obtuse lobes; and f. *chondroides*, with segment- and frond-tips variously frilled or crested. Finally there is a monstrosity, termed f. *alato-multifidum*, founded on specimens from Carbon County, Pennsylvania; in this the frond tip is crested, while the segments are acute, and connected by a broad wing. (Poyser also listed f. *marginatum* and v. *rotundatum* from Lancaster County, but these are the typical and *brachypteron* forms respectively.)

LYCOSPHENS

LYCOPODIACEAE

Lycopodium

L. selago v. *typicum.* The circumboreal Fir Clubmoss has been found but once in Pennsylvania, Porter's record reading "Monroe, Water Gap, at the summit of the mountain . . . *Knipe.*" The specimen is preserved in the herbarium of the Academy of Natural Sciences of Philadelphia.

L. *selago* v. *patens.* Cliff Clubmoss, also circumboreal but ranging farther south than the preceding variety, has likewise only a single known station here. This, discovered subsequent to Porter and Poyser's day, is at Raymondkill Falls, in Pike County.

L. lucidulum v. *verum.* In contrast to the species just discussed, Shining Clubmoss is one of the commonest species in the state, growing in swamps, moist woods, and rocky slopes or rarely shaded crevices of cliffs throughout. There are 57 counties represented in herbaria.

L. annotinum. Three varieties of Bristly Clubmoss occur in Pennsylvania, but they intergrade freely, and herbaria contain more intermediate than definitely classifiable specimens. Porter listed the species from 7 and Poyser from 8 mountain counties; to date 25 are known.

The v. *typicum* with spreading more or less serrate leaves is present throughout. Usually associated with it, but known in characteristic form with the leaves entire only in 10 counties, occurs v. *acrifolium.* These are both occupants of cool rocky woods at moderate to high altitudes. The smaller relative with short entire appressed leaves, v. *pungens,* is known to grow in boggy places in Monroe and perhaps other counties.

L. clavatum. Running Clubmoss is well known to occur throughout the state, though rare southeastward. Growing chiefly in dry to moist sterile woods, it reaches its greatest abundance in the cut-over lands of the Pocono Plateau. There are 50 county records. Its fertile branches usually fork toward the top and bear 2 or 3 cones (strobili) of sporangia. Sometimes there is only a single cone, but this can hardly be classed as the v. *megastachyon,* because the same individual plant may bear both single and multiple cones on different branches.

L. obscurum v. *genuinum.* Flatbranch Groundpine was first collected near Philadelphia by John Bartram and sent to Europe for naming. It grows in moist to dry acid woods throughout, having been collected in 54 counties. The characteristic flattening of the leafy branches, due to the marked shortening of the upper and lower ranks of leaves, can usually be readily seen when a plant is viewed from the side; but occasional individuals grade into the following variety.

Lycopodium obscurum v. *dendroideum.* This variety differs from the preceding in having its leaves about equal in length on all sides of the branches, and so is termed the Roundbranch Groundpine. While found at times in much the same situations as its relative, it more frequently migrates out into sunny bogs or rock crevices, and then becomes more compact in aspect and bears more numerous cones. Less common than the other variety, this has 43 county records.

L. tristachyum. In typical development the circumboreal Slender Groundcedar has a deep-seated rootstock, glaucous foliage, cord-like branchlets which show constrictions representing cessation of growth during winter and new growth of the same axis the following spring, and elongate cones in groups of 3 or 4. Variants with shallower rootstock, and others with bright green foliage are known, representing transitions toward the two following species. It grows in decidedly sterile, acid woods, and though present nearly throughout the state, is common only locally in the Pocono region. Porter knew it from but 2 and Poyser from 4 counties, but it has subsequently been collected more extensively and is now known from 29.

L. complanatum. The records of this species given by Porter and Poyser actually represent the next-following one. Recently it has been recognized, however, that Northern Groundcedar extends as far south as Pennsylvania. It is characterized by having a shallowly buried rootstock, bright green foliage, rather irregularly developed ribbon-like branchlets with seasonal growth-constrictions, and short single or paired cones. Specimens are preserved from both Monroe and Wayne counties, the former representing the southeasternmost station of the species, latitude 41° 13′.

L. flabelliforme. Some authors consider Southern Groundcedar only a subspecies or variety of the Northern, but they are here kept apart. The present one has a superficial rootstock, bright green foliage, upright stems symmetrically divided into fans of ribbon-like branchlets which show no growth-constrictions (or rarely a very few), and elongate cones in groups of 3 or 4. Commonest of the group, this plant grows in woodland litter throughout the state, there being specimens preserved from every county but Mercer.

L. inundatum v. *typicum.* The circumboreal Dwarf Bogclubmoss was known to Porter from but 6 and Poyser 7 counties. Actually it grows in sandy or gravelly openings in sphagnum bogs and acid spring runs in many parts of the state, the county list now standing at 22.

L. inundatum v. *bigelovii.* The east-American Tall Bogclubmoss was recorded from Delaware County by Porter, but questioned by Poyser. We now know it from Bucks, Carbon, Clearfield, Delaware, Erie, Lackawanna, Lancaster, Monroe, and Philadelphia, or 9 counties.

Lycopodium adpressum. Southern Bogclubmoss, often regarded as a variety of the next-preceding species but here kept distinct, is characterized by the strongly appressed sporophyls, yielding a decidedly slender cone. It was not known to Porter, but was included by Poyser, under the name *L. chapmani,* from Bucks and probably Delaware county. It is now definitely recognized in Bucks, Delaware, Lancaster (inland limit), and Philadelphia.

(*L. alopecuroides.* Though accredited to Pennsylvania by both Porter and Poyser, there is considerable doubt whether this southern Coastal Plain species actually enters the state. All its supposed specimens represent robust forms of *L. inundatum bigelovii.*)

SELAGINELLACEAE

Selaginella

S. rupestris. Rock Spikemoss was recorded by Porter from 7 and by Poyser from 8 counties. It is now known to grow on dry slopes of granite, sandstone, and other rocks yielding moderately acid soils, throughout the southeastern half of the state, in at least 20.

S. apoda. Meadow Spikemoss was discovered in Pennsylvania by Bartram. It grows in wet muddy situations, along brooks and in sunny openings in grassland or thickets, throughout the state. Though often overlooked by collectors of vascular plants because of its resemblance to a moss it has reached herbaria from 30 counties.

ISOETACEAE

Isoetes

I. engelmanni. Appalachian Quillwort, the commonest species in the state, grows in shallow ponds, wet thickets, sluggish streams and even on river shores where protected by coarser plants from strong currents. There are records for 33 counties, chiefly southeastern. Porter recognized beside the typical variety (or subspecies) a slender one called *gracilis,* from two, and a coarse vigorous one termed *valida,* from three counties; Lancaster was the type locality of the latter. Still another was described by A. A. Eaton in 1905 and included by Poyser: v. *fontana,* the type colony being in a spring along the railroad near McCalls Ferry, Lancaster County.

I. echinospora v. *braunii.* The circumboreal Prickly-spored Quillwort is represented in America by a variety which is often classed as a species. Previous compilers listed it from only 5 counties, but it is now known from 12 chiefly northeastern ones. A vigorous variant, variously classed as a subspecies, variety or forma *robusta* was reported by Porter from Bucks County, but the record is doubtful.

Isoetes riparia. Riverbank Quillwort was originally collected by Nuttall along the Delaware river near Philadelphia. Its typical variety is known only from this river and its tributaries, in Bucks, Delaware, Lehigh, Philadelphia, Pike, and Wayne counties. A closely related plant termed by some workers *I. riparia* v. *canadensis,* and by others *I. dodgei,* has been collected in ponds in Franklin, Lackawanna, Pike, Sullivan, and Wayne. Reports of other species, such as *I. lacustris* and *I. saccharata,* are believed to represent erroneous identifications.

EQUISETACEAE

Equisetum

E. prealtum. American Scouringrush was classed by Porter as *E. hyemale,* by Poyser as *E. hiemale* ssp. *affine* and ssp. *robustum.* It grows on alluvial banks and calcareous-sandy slopes in the southeastern parts of the state, becoming rare northwestward. The present list stands at 30 counties.

E. laevigatum. Smooth Scouringrush was reported by Porter from Northampton County, but questioned by Poyser, and the specimens from there actually prove to have been misidentified. It is now well represented in herbaria, however, from Presque Isle, Erie County.

E. variegatum. The little Variegated Scouringrush was collected in Erie County many years ago, but has not been recently found in the state.

E. fluviatile. Water Horsetail is well known in swamps and ponds, chiefly in the northern part of the state. It is represented in herbaria (in part as the unbranched f. *limosum*) from 36 counties.

(Reports of *E. litorale* from various counties, including a variety *elatius* recorded by Eaton from Lancaster, appear to refer to mere depauperate forms of *E. fluviatile.*)

(*E. palustre.* Specimens from Easton, Northampton County were identified as the American Marsh Horsetail by the late J. H. Schaffner, but only aberrant *E. fluviatile* appears to be represented.)

E. sylvaticum v. *multiramosum.* Sylvan Horsetail occurs scattered throughout the state in cool moist woods and swamps. There are 37 county records.

(Reports of *E. scirpoides* in the state are wholly unauthenticated.)

(*E. pratense.* Porter and Poyser listed Meadow Horsetail for Clearfield County, but the specimens so labelled prove to be *E. arvense.*)

E. arvense. Field Horsetail is common throughout the state in moist thickets and muddy banks, also invading artificially dumped soil, cinders, etc. It has been collected in every county but Clarion and Mifflin. It appears in numerous forms, but most of these are scarcely worthy of separate naming. The striking variant with a cone borne at the tip of an apparently normal sterile shoot, f. *campestre,* has been collected in Allegheny County.

Discussion and Summary

In the nomenclatural taxonomic portion of this paper one new form is described (p. 12) and new names proposed for infra-specific entities in 6 cases (pp. 12, 13, 14, 16). Five changes in status (pp. 12, 13, 14, 15) as well as 5 new combinations (pp. 18, 19, 20), including some where a previous usage was not validated, were made. The most noteworthy are: *Botrychium obliquum* f. *confusum* for the intermediate between that species and *B. dissectum*; *Dryopteris slossonae* for the rather common hybrid of *D. cristata* and *D. marginalis*; and the placing of the two Oakferns in the relatively recent genus *Currania*, as *C. dryopteris* and *C. robertiana*.

In the geographic treatment a total of 81 species, 48 varieties, 36 forms, and 13 hybrids are recognized in Pennsylvania, a considerable increase over the earlier lists. The species new to the state (some included in earlier lists in a different status or interpretation), comprise: *Botrychium multifidum*, *Pellaea glabella*, *Asplenium resiliens*, *A. trudelli*, *Athyrium angustum*, *A. asplenioides*, *Dryopteris intermedia*, *D. campyloptera*, *D. clintoniana*, *Currania robertiana*, and *Lycopodium complanatum*.

Noteworthy additions to the state's list of varieties are: *Botrychium multifidum* v. *typicum*, *B. obliquum* v. *oneidense*, *B. simplex* v. *laxifolium*, *Ophioglossum vulgatum* v. *pycnostichum*, *Cystopteris fragilis* v. *genuina*, *C. fragilis* v. *laurentiana*, *C. fragilis* v. *protrusa*, *Asplenium platyneuron* v. *hortonae*, *A. rutamuraria* v. *ohionis*, *Athyrium angustum* v. *typicum*, *A. angustum* v. *elatius*, *Dryopteris spinulosa* v. *concordiana*, *D. clintoniana* v. *australis*, *Lycopodium selago* v. *patens*, and *L. annotinum* v. *pungens*.

Important forms new to the state are: *Botrychium obliquum* f. *confusum*, *Osmunda cinnamomea* f. *cornucopiaefolia*, *O. cinnamomea* f. *glandulosa*, *Onoclea sensibilis* f. *acutisegmenta*, and *Equisetum arvense* f. *campestre*.

Deletions from the list of ferns attributed to Pennsylvania by various compilers, resulting from review of the evidence and recognition of their unsatisfactory character are: *Osmunda cinnamomea* f. *crenulata* (a juvenile freak); *Asplenium fontanum* (identification correct but source dubious); *Athyrium filix-femina* (material now assigned to two other species); *Lycopodium alopecuroides*) reidentified as a var. of another species); *Isoetes lacustris* (a mere guess as to identity); *Equisetum litorale* and *E. palustre* (reinterpreted as forms of *E. fluviatile*); *E. scirpoides* (no authenticating specimens or records found); and *E. pratense* (material proves to have been misidentified).

Botanical Collectors of the Philadelphia Local Area [1]

FRANCIS W. PENNELL

As you all know, the Philadelphia local flora is understood by the Philadelphia Botantical Club as being that of the area covered by the Club's Local Herbarium at the Academy of Natural Sciences of Philadelphia, an area comprising all southern New Jersey, Pennsylvania southeast of the Blue Ridge and east of the Susquehanna River, the northern county of Delaware, and the northeasternmost of Maryland. In noting the persons who have collected the plants of this territory one is impressed both by the number of them and the historical continuity of their labors. No other part of the New World can show such a record. In my recent account of eastern Scrophulariaceae,[2] for which I cited only one specimen to a county and gave precedence to such numbered collections as Bayard Long's and my own, I find that there are given from this area records of more than 100 different individuals. And the succession of collectors within our local area stretches without break from John Bartram in the early eighteenth century to the botanists assembled here to-night.

Yet Philadelphia did not have the earliest botanical collectors in our country. Before Bartram was born John Banister was sending dried plants from Virginia to England, and so were William Vernon and Dr. David Krieg from Maryland. That was in the latter years of the seventeenth century, about the time that Philadelphia was founded. It was John Clayton of Virginia, fourteen years older than John Bartram, whose collections were reported on in the "Flora Virginica" of Gronovius, and, because that work was the main source of Linnaeus' knowledge of our eastern flora, Clayton's plants must ever stand as the original specimens or types of most of our familiar native species. Indeed, with such predecessors it seems surprising that John Bartram has been so widely hailed as the "Father of American Botany".

Nor, furthermore, has the study of systematic botany reached its highest American distinction in our area. Philadelphia was dominant in the late eighteenth and early nineteenth centuries, but after Nuttall's return to England in 1841 never again was there a large output of comprehensive work here. For a century leadership has been alternately at New York or Boston, with Torrey at New York, then Gray at Cambridge, then Britton at New York, then Fernald at Cambridge; among these Asa Gray was undoubtedly the greatest taxonomic botanist that our country has produced. Yet, though not commencing so early as the botanical interest south of us, nor reaching so commanding a position as that north of us, for two centuries now within the Philadelphia area there has been a steady succession of field botanists, persons interested in the identities and the local distributions of plants.

---

[1] Prepared for the commemoration of the Fiftieth Anniversary of the Philadelphia Botanical Club, December 19, 1941. For invaluable assistance I am indebted to Dr. John H. Barnhart of the New York Botanical Garden, and to my colleague, Mr. Bayard Long.

[2] The Scrophulariaceae of Eastern Temperate North America, Monog. Acad. Nat. Sci. Phila. 1: 1-650. 1935.

Ours must be a remarkably rich terrain to support such study. It is. The combination of inland and coastal plain, such peculiar areas as the serpentine barrens, everywhere the presence of ungrazed woodland that has persisted from the original forest, tempt one constantly afield. That the area has not lost its lure is proven by the career of our present curator of the Local Herbarium. Mr. Long still collects with the ardor of thirty years ago, and he can provide any inquirer with a goodly list of problems still demanding field-inquiry.

Yet such potentialities exist elsewhere over North America, and many a western state, with vastly more exciting terrain, has had few if any local botanists. Settlement there is new, while here it is old. But even an old center, fully comparable in background, may lack such a history as we possess. Baltimore, and its vicinity, even though collecting commenced so early in Maryland, has developed very few local botanists. Perhaps that is mere chance, but, however an absence may be explained, one wonders if the presence of such interest iin the Philadelphia territory may be in some degree due to certain cultural strains. With us the Quaker and the German groups, both of them here from the days of Penn, have contributed a surprisingly large proportion of our collectors. To the former stock pertain the Bartrams, Marshall, Collins, Darlington, Baldwin, Conrad, T. P. James, Michener, Edward Tatnall, George Martin, Canby, the Smiths (George, Charles E., and Benjamin H.), Horatio C. Wood, and J. Bernard Brinton, the founder of our Club; to the latter Muhlenberg, Schweinitz, Pursh, Wolle, Porter, Herbst, Rau, and Harshberger. (However, independent of these we have the Bartons, Rafinesque, Nuttall, Durand, Pickering, Carson, Redfield, Ellis, and others.) But more important than such cultural strains in accounting for Philadelphia's botanical prestige must really be the broad intellectural leadership that belonged naturally to the metropolis of the colonies and the early capital of the nation.

In the days of the elder Bartram Philadelphia was colonial. John's opportunity to travel came from the desire in England for curious and horticulturally satisfactory garden plants. From 1735 to 1765 he was repeatedly traveling, at first in Pennsylvania, but eventually from Lake Ontario to Florida. Both live plants and dried specimens went to England.[3] I suppose that some of John Bartram's plants now at the British Museum in London are the earliest botanical specimens ever made from our local area, unless it be that a few others there that were collected by John Clayton "when I went up Delaware"[4] be yet earlier.[5] (Bartonia 12, Suppl. 7-19, 1931. Harshberger, Botanists of Philadelphia 46-49, 1899.)[6]

---

[3] His son, William Bartram, author of the delightful "Travels", spent the years immediately preceding the Revolution in a scientific journey through the southern colonies from North Carolina to Florida and Louisiana, and he gathered therefrom specimens that likewise went to England; but he seems to have collected very little at home, although a specimen gotten by him at his brother John's farm is among the B. S. Barton plants at the Academy.

In the middle years of John Bartram's life came Pehr Kalm, sent from Sweden largely through Linnaeus' interest, to obtain information and specimens of plants from eastern North America. From September, 1748, till early June, 1749, he was within our area, at points from Philadelphia and Wilmington to Raccoon Creek and Repaupo in southern New Jersey. Later, he went to Quebec and across central New York to Niagara Falls, with the result that, on his plants reaching Linnaeus apparently in advance of his records of travel, the master assumed that they might all be attributed to Canada, which at that time included the whole valley of the St. Lawrence River. Hence it is that "canadensis" became applied to so many plants of our territory, even to *Linaria canadensis* which Kalm's diary shows that he really gathered on Raccoon Creek in southern New Jersey. I was at first hesitant as to whether John Bartram had commenced making an herbarium so early as Kalm's visit, but fortunately Kalm himself, under date of September 29th, 1748, gives an account of "Mr. Bartram's Herbarium". (H. 77.)

Humphry Marshall, John Bartram's younger cousin, like him formed a botanical garden, some surviving trees of which may still be seen at Marshallton in Chester County, Pennsylvania. He made it an arboretum, and his special interest in trees led to his publishing in 1785 the first considerable botanical work in the United States, his "Arbustum[7] Americanum". Whether he made herbarium specimens I do not know, but I suspect that, after the manner of his cousin, such were prepared and possibly sent to England. Nor do we know that any were made by his nephew Moses Marshall. (H. 77-85.)

By this time the Pennsylvania-German group had also become active, Muhlenberg's collecting beginning about the time of the Revolution. At the Moravian community Samuel Kramsch appears to have been the pioneer, and there has survived his manuscript "Flora Nazarethena spontanea collecta in annis 1787 et 1788", to which Christian Denke added a supplement in 1797. Nazareth Hall was a boy's school, and there Lewis David von Schweinitz was a pupil from 1787 to 1797, leaving as a youth of seventeen. One sees clearly to what influence he owed his lifelong devotion to botany. But before passing to the mature work of Muhlenberg and Schweinitz we should consider several visitors from Europe.

---

[4] See Monog. Acad. Nat. Sci. Phila. 1: 417. 1935.

[5] Dr. Harshberger's "Botanists of Philadelphia and their Work", a mine of information concerning our history, and from which much of my information is derived, lists before John Bartram, James Logan, Penn's secretary for Pennsylvania and famous as one of the first experimental workers in our science, and Dr. Christopher Witt, who may well have included native plants also in his garden. Neither of these are known to have made dried specimens, nor are any such known from the previous Swedes and Dutch on the Delaware.

[6] These sources of information will be cited below as "B" and "H", respectively. An asterisk denotes an accompanying portrait.

[7] By a typographical slip (or through ignorance) this appears on the title-page as "Arbustrum".

From 1780 to 1840 may be called the classical period of Philadelphia botany. For six decades the outstanding botanical studies of this country were either made in our territory, or the botanists achieving them at least visited Philadelphia or kept in touch with botanists or other intellectuals here; especially was this contact with the American Philosophical Society, which had such significant influence on the cultural life of the young nation. André Michaux, sent out in 1785 by the French government, remained in this country until 1796; in the course of travels that extended from Florida to Lake Mistassini in Quebec and to the prairies of Illinois he repeatedly visited Philadelphia, in 1793 spending several months here.[8] We may be sure that he did not refrain from collecting while in our section. With such wide acquaintance with American plants it is indeed fitting that there resulted from his journeys, though not until after his death in 1802, the first comprehensive flora of temperate North America, his "Flora Boreali-Americana" published at Paris in 1803. Another Frenchman, Baron Palisot de Beauvois, who was resident in Philadelphia from 1791 to 1798, also collected widely over the eastern United States ("from New York to Ohio south to Georgia"), but he was less fortunate, and lost all his specimens by shipwreck during his return to France.[9]

With Andre Michaux throughout his wanderings in North America was his son, Francois Andre Michaux, who, born in 1770, was then a young man. The son was especially interested in woody vegetation, and after his father's death returned to this country for further investigation of our trees and shrubs. He tells of his travels in the introduction to his "Histoire des Arbres Forestiers de l'Amerique septentrionale", the three volumes of which with their beautiful colored plates appeared in Paris from 1810 to 1813. Later this work was translated and reissued in Philadelphia from 1817 to 1819 as "The North American Sylva". His travels show that for him Philadelphia was an important base, and so interested did he become in the American Philosophical Society in this city that he not only sent to it his father's diary but he bequeathed it what has ever since been its most valuable fund for obtaining botanical works. The younger Michaux died in France in 1855.

By 1803, the year of Michaux's "Flora", Muhlenberg was fifty years of age, and we can picture him in his Lutheran parsonage at Lancaster as sparing every possible moment for his botanical studies. Rev. Henry Muhlenberg[10] assembled, by his own and others' collecting, the first large herbarium that has survived in this country.[11] His own botanizing was nearly wholly in Lancaster County, Pennsylvania. For the first time extended and detailed attention was given to our grasses and sedges, and it is fortunate that this part of his work has received adequate publication. As his herbarium grew, manuscript book after book was filled with projected works, but few of these have ever had their minute German script transformed into printed text. At the American Philosophical Society there are 23 such manuscript books. But what would be the most valuable to us, a more finished " Flora of Lancaster County ", was sold by Muhlenberg's son, and—alas for us—later passed to Professor Gray, so that it is now at Harvard University far from its native county. His contemporaries expected much of Muhlenberg, and after the appearance of Michaux's Flora he evidently attempted to get his notes into order. Ultimately, in 1813, there did appear a work sufficiently comprehensive in scope, but actually little more than a catalogue with tabulated statements of structure and occurrence, his " Catalogus Plantarum Americae Septentrionalis ". Besides flowering plants it included ferns, mosses, lichens, algae, and fungi. In the preface to this Catalogue is a list of the persons from whom he had obtained specimens, those from our area being Baldwin, Barton, Collins, Denke, Dr. Frederick Kampman, Matthias Kinn, Dr. James Mease, Pursh, Rafinesque, and Rev. Jacob Van Vleck.[12] Muhlenberg's herbarium, including without signs of recognition the specimens of these contributors, passed after his death in 1815 to the American Philosophical Society by which it has been deposited at the Academy of Natural Sciences. It needs a thorough study. (* H. 92-97.)

---

[8] Journal of Andre Michaux, 1787-1796. Ed. C. S. Sargent. Proc. Amer. Philos. Soc. 26, No. 129: 1-145. 1888.

[9] Palisot de Beauvois as an overlooked American Botanist, by E. D. Merrill. Proc. Amer. Philos. Soc. 76: 899-920. 1936.

Seven years younger than Muhlenberg was Dr. Benjamin Smith Barton. In many ways the two men were in contrast, although in some ways their careers ran strangely parallel courses. Barton was also associated with Lancaster, and with a clerical household, his father having been the Episcopal clergyman there. He likewise assembled an herbarium, which was quickened into fresh activity by the publication of Michaux's " Flora ". He also dreamed of a " Flora " of his own; this production never resulted for him in anything paralleling Muhlenberg's " Catalogue " although another carried it on to a far greater achievement. Barton too died in 1815, and his herbarium also passed to the American Philosophical Society; finally both herbaria are now together deposited at the Academy of

---

[10] Fully, Gotthilf Heinrich Ernst Muhlenberg.

[11] Clayton's own herbarium, presumably duplicating what had been sent to Gronovius in Holland, was, soon after his death in 1773, destroyed by a fire that consumed the courthouse of New Kent County, Virginia. (See A. B. Massey, in Claytonia 1: 1, 1937.) Thomas Walter's herbarium, made in South Carolina between 1760 and 1789 passed to London, and eventually to the British Museum.

[12] Of these Kampman, Kinn, and Van Vleck will be considered in relation to Schweinitz. Dr. Mease (1771-1846) was a prominent Philadelphia physician, active in the affairs of the American Philosophical Society.

Natural Sciences. The composition of Barton's herbarium is more evident than that of Muhlenberg's, while the two together may be taken as indicative of botanical interests about 1800.

Benjamin Smith Barton was for many years professor of natural history in the University of Pennsylvania, holding the first American chair of that subject. In 1803, the year of Michaux's "Flora," he brought out in Philadelphia his "Elements of Botany", the first text-book of our science in this country. As to his herbarium, he collected somewhat himself but received more from his pupils and associates, the contributions of each of whom he carefully indicated. The specimens are from many parts of the then United States, those from our Local Area being, beside Professor Barton's own, John Adlum's and Mathias Barton's from Lancaster, Christian F. Denke's from Northampton County, Pennsylvania, Dr. Gregg's from Cape May County, New Jersey, and Frederick Pursh's from various places near Philadelphia on either side of the river. It was on Pursh that Barton was depending for the fulfillment of his "Flora", and it is chiefly as the patron of Pursh and Nuttall that he is to be remembered in North American taxonomic botany.[13] (B. 9: 17-34. H. 108-113.)

Far more intimately than Michaux, Pursh is to be associated with Philadelphia. As a young immigrant German he was the gardener at William Hamilton's estate, the "Woodlands",[14] where on the hill and the slopes down to the Schuylkill that gentleman had extensive beds of native and foreign plants, constituting one of the choicest gardens of its time. There Pursh was found by Professor Barton who employed him upon the projected "Flora", sending him in 1806 on a pedestrian journey through the mountains of Virginia and in 1807 to western New York and southern Vermont. The specimens from those trips survive in the Barton Herbarium, and along with them local plants collected at Blockley, "Skuilkill", "Woodlands", Bucks County and in "Jersey". After leaving Philadelphia in 1808 Pursh reached England in 1811 and there with the patronage of Aylmer Bourke Lambert eventually produced under his own name at London in 1814 what was at last the outcome of Barton's dream, his "Flora Americae Septentrionalis". More carefully than Michaux he tells what herbaria he has consulted, and with the same thoroughness that led him on his labels to give the locality of each plant he even supplies information as to whether he has seen a species living or only dried. Pursh later settled in Canada, where he died in 1820. (H. 113-117.)

---

[13] For Barton and his relation to Pursh see Bartonia 9: 17-34, and for sketches of the contributors to the Barton Herbarium, l.c. 35-42, 1926, these sketches being by Dr. J. H. Barnhart. (John Adlum's numerous specimens came mostly from the Pennsylvania mountains; unfortunately we know nothing more of Dr. Gregg, who was surely the earliest collector at Cape May.) For Barton's relation to Nuttall see Bartonia 18: 45-51, 1936. The last reference also recounts the recent "finding of the Barton Papers", by V. M. Delafield. My latest paper on "Benjamin Smith Barton as Naturalist", read to the American Philosophical Society Feb. 13, 1942, is to appear in its Proceedings.

[14] Now Woodland Cemetery in West Philadelphia.

But the very year after Pursh's departure in 1808 Barton was encouraging another young immigrant, and it is likely that he hoped to find a real successor to Pursh in the keen English printer, Thomas Nuttall. From 1809 to 1811 Nuttall travelled on Barton's account. We can not follow now the adventures of this enthusiast; suffice it to say that until 1841 he was repeatedly resident in Philadelphia, and from his base at the Academy of Natural Sciences (which was founded in 1812) went on collecting expeditions that led up the Missouri River, to the Arkansas Territory, to Florida, and eventually across by the Oregon Trail to the Pacific Ocean. Our local plants were not neglected, as is evident on looking into his " Genera of North American Plants ", published here in Philadelphia in 1818.[15] Some, especially those occurring in the tidewater of the Delaware River, received special consideration in the Journal of the Academy of Natural Sciences.[16] Nuttall's " Genera " was one of the keenest works of its time, being actually a critical supplement, both as regarding genera and species, to Pursh's " Flora ". It was only at the Philadelphia Academy that Nuttall seemed able to flourish botanically. Although he was for nearly ten years at Harvard University he published no botanical work during that period, whereas on a few weeks' visit to Philadelphia early in 1834 he promptly prepared three papers for the Academy's Journal.[17] After his return to England in 1841 he all but disappeared from productive botanical work, only to blossom forth with all his old time vigor on a visit to Philadelphia over the winter of 1847-48, when he described the new species in a large collection of California plants then newly received. While most of Nuttall's earlier collections seem to be in the herbarium of our Academy, we have a smaller series of his later plants; and his own herbarium, taken with him to England, passed after his death in 1859 to the British Museum. (* B. 18: 1-51, 1936; 19: 50-53, 1938. * H. 151-159.)

The founding of the Academy of Natural Sciences in 1812 is one of the important landmarks in the scientific life of Philadelphia. It represented the second stage in the associating together of the intellectually minded of our community. The first stage had been the establishment of the American Philosophical Society in the middle of the eighteenth century, a club that embraced all fields of intellectual interest. But in the latter years of the eighteenth and the early nineteenth centuries came a division of the field into such groups as the College of

---

[15] In Nuttall's " Genera " are mentioned collections from our area by W. Baldwin, Dr. W. P. C. Barton, Dr. Isaac Cleaver, who gathered plants both in Pennsylvania and New Jersey near Philadelphia, Z. Collins, W. Darlington, R. E. Griffith (" Griffiths "), and Dr. W. " Stuve " of Bremen, to whose memory was dedicated *Lespedeza stuvei* which he had discovered in New Jersey. In an unpublished letter from Collins to Rafinesque, dated Nov. 19, 1817 from Philadelphia, Collins says of this man: " His name is Steuve, we call him Dr. Steuve. He is from Bremen and has settled here about 18 months, [he] has a laboratory and makes chymicals colours & c. . . . is fond of plants and for the time has made from this neighborhood a handsome collection of them."

[16] 1: 111-123, 1817.

[17] The probable explanation is that there were then few botanical books or specimens at Harvard, relative to those at the Academy in Philadelphia.

Physicians, for the cultivation of medical interests; the Franklin Institute for what we have come to call the exact sciences of physics and chemistry; and the Academy of Natural Sciences for botany, zoology, and geology. The Academy, though at first it was but a small club with a single room for its meetings and possessions, could better care for collections and attend to their study. As the Academy gained prestige in its field the study of the natural sciences came increasingly under its care, rather than that of the American Philosophical Society—a process harmonious enough, for the membership was to a good degree overlapping. The Academy, as well as the Society, played an important role in the later portion of our Classical Period, although neither organization proved sufficient to prevent the ensuing decline in botanical production. (Such a decline was largely peculiar to botany, as the zoological sciences kept their high standing at the Academy during the middle nineteenth century.) But to return to the early decades of the century.

Closer still to Benjamin Smith Barton must have stood his nephew, Dr. William P. C. Barton. He shared his uncle's interests both in botany and medicine, and succeeded him in his professorship at the University of Pennsylvania. Chronologically he was quite contemporary with Thomas Nuttall, being born in the same year 1786, publishing his main work likewise in 1818, and finally dying in 1856 only three years before Nuttall. The main work of the younger Barton was his " Compendium Florae Philadelphicae ", which bore the explanatory further title: " Containing a Description of the Indigenous and Naturalized Plants found within a Circuit of Ten Miles around Philadelphia ". It was the first local flora of the Philadelphia district, and such was its merit that we have appropriately named for its author the modern journal of the Philadelphia Botanical Club " Bartonia ". In the younger Barton's two-volumed work, the small size, durability, and lightness of which readily enables one to carry it afield, are given descriptions of each species with notes on its occurrence. I suppose that all Barton's collecting ground is now built over, but it is interesting to turn the pages of the " Compendium " and realize the choice collecting spots that then existed on both sides of the river. In connection with certain species various other collectors are mentioned. Most frequent are acknowledgments to Collins and Nuttall, but there are also such to Theophilus Beesley of Salem, New Jersey, Dr. Stuve of New Jersey, and Drs. Eberle and Muhlenberg of Lancaster, Pennsylvania. His specimens show that he also obtained much from Dr. Cleaver (" Clever "). A mystery surrounds the present whereabouts of the bulk of the younger Barton's herbarium. Plants of a few families are in the Academy's herbarium, and these bear a special label in Redfield's handwriting, thus showing that they were prepared between 1876 and 1895. Although much keeps appearing from boxes that have long been stored away, it hardly seems possible that any collection of the size of this can be in our possession unidentified. (H. 159-163.)

In following the Barton association on to Nuttall and the younger Barton we have departed from a strict chronological sequence, for the latter were not born until 1786, whereas five others whom we should consider were born in the short interval from 1779 to 1784. But such an inversion of chronology is only apparent, for the work of these older men was contemporary with or reached its main flowering after Nuttall's "Genera" and the younger Barton's "Compendium".

In 1779 were born William Baldwin and Solomon W. Conrad. Both collected much and published little, but that little of such quality that we wish it had been more. Had Dr. Baldwin but lived more than the forty years that were his, we should in all likelihood have had more critical studies like the two on southern grasses and sedges that appeared in his last year of life. A native of Chester County, Pennsylvania, he resided some years at Wilmington, Delaware, and there made considerable study of the local plants. Later he collected extensively on the southern border of the United States, along the St. Mary's River between Georgia and Florida. Baldwin we know personally through the letters that Darlington has preserved for us in the "Reliquiae Baldwinianae". He and Darlington were both from Chester County and of similar Quaker households, had studied together under Professor Benjamin Smith Barton, and were both the combination of physician and botanist so characteristic of the time. He died in 1819 in Missouri, while on Long's Expedition to the Rocky mountains. Baldwin's specimens are now at the Academy of Natural Sciences, but, before reaching this haven, they had the misfortune to fall into Schweinitz's hands. What that meant we shall see anon. (H. 119-125.)

Solomon W. Conrad also assembled an herbarium, which so far as I am aware came wholly from our local territory. It survives at the Academy, with original labels that gave only the name and information of locality, but to which the careful conservator John H. Redfield, who in the latter part of the last century saw to the mounting of the old collections, has often added Conrad's name. Conrad lived at Burlington, and his specimens were mostly gathered in Burlington and Mercer counties, New Jersey. He published a few botanical papers, and in the Academy's Journal described a new species each of *Juncus* and *Corallorhiza*. In 1829, when fifty years old, Conrad was made Professor of Botany at the University of Pennsylvania, but his incumbency was short as he died in 1831. (H. 125-126.)

With Schweinitz, born in 1780, we return again to the Moravian community at Bethlehem, Pennsylvania. We have spoken of his being a student under Kramsch and associated with Denke. Both those men went later to Salem, North Carolina,[18] the southern Moravian headquarters, and thither, after a period of study followed by administrative work in Germany, went Rev. Lewis David von Schweinitz also. It was in North Carolina that he assembled much of his enormous herbarium, which included all groups of both flowering and flowerless plants. Having studied under one of the leading students of Fungi in Europe, it was natural that in Carolina Schweinitz gave special attention to these little-known plants. After only nine years at Salem he came again to Bethlehem, and spent there his remaining thirteen years, from 1821 to 1834. In 1831 he published his greatest work, "Synopsis Fungorum in America Boreali degentium", which has remained the foundation for American mycology. He also prepared a " Synopsis Plantarum Americanarum ", treating of flowering plants and ferns, but it has remained in manuscript. After his death in 1834 his herbarium passed to the Academy of Natural Sciences of Philadelphia, and the accounts say that it was then larger than the Academy's own series of plants. (B. 16: 1-8. * H. 127-132.)

It is amazing to realize what botanical work Schweinitz added to a busy administrative career. This becomes yet more remarkable when one discovers from his manuscripts, also bequeathed to the Academy, what a passion he had for making catalogues. Three or more times did he write out complete ledger-book records of all his specimens, fully classified scientifically, and the largest and last of these is preceded by a list of more than 100 " Contributores ". Besides this, in an address-book there is a special list of " Botanical Correspondents ". As Schweinitz had the reprehensible (and I trust unique) habit of discarding all original labels, and as his geographical data are usually reduced to a statement of the country or such expressions as " Bethl " for those gathered on trips during his residence at Bethlehem, any accessory information is welcomed. These lists of contributors show the cosmopolitan composition of Schweinitz' vast herbarium, but among the many names selection must be confined to those of persons collecting in our Local Area. There are: Daniel Steinhauer and Dr. Griffith of Philadelphia; Mr. Detwiller (" Dettwyler "), with plants from Pennsylvania; James Read (" Reed "), with plants from " China & Pensyl & Jersey "; Eugene Frueauff with plants from " Siles & Nazareth "; Dr. Freedly of Philadelphia; Dr. Darlington of " Chester ", evidently the county; Jacob Van Vleck, with plants from " Bethl & Carol "; Dr. Muhlenberg of Lancaster; Zaccheus Collins, for plants from various parts of the continent (" Americanae ") ; Dr. Kampman, for plants from " Jersey "; Samuel Kramsch, for plants from " Carol & Pensyl "; Matthias (" Mathew ") Kinn, deceased (" beatus "), and Solomon Conrad, of Philadelphia; Charles[19] Wister (" Wistar ") of Germantown (" Germanton "), Philadelphia;

---

[18] Rev. Samuel G. Kramsch (1756-1824), Schweinitz' early teacher, died at Salem. (B. 16: 28.) Rev. Christian F. Denke (1775-1838), did not reach North Carolina until 1820 which was after several years' missionary work among the Indians of western Ontario; he supplied Schweinitz with plants from " Canada & N. Carol ". (B. 9: 37.)

[19] Apparently originally confused with Caspar Wistar, the prominent Philadelphia physician and President of the American Philosophical Society, as it so appears on the list of " Botanical Correspondents " and has been written over from this on that of the " Contributores ".

Dr. Huebener (" Hübner ") of Nazareth; and Charles Kluge of " Salem & Naz." Moravian centers on this list are Bethlehem and Nazareth in Pennsylvania, and Salem in North Carolina. Also mentioned are Dr. Baldwin, C. F. Denke, Thomas Nuttall, Dr. Charles Pickering, and Rafinesque, but for plants from outside our territory; some had already left this section, while others had hardly arrived.[20]

Some of these collectors will appear later, while others must be briefly considered now. Daniel Steinhauer, a fellow Moravian, living from 1785 to 1852, taught in our area at Philadelphia, Lancaster, Nazareth, and Bethlehem. (B. 16: 34.) Rev. Eugene A. Frueauff, Schweinitz' nephew and his assistant at Bethlehem, later assembled an herbarium that has passed to the Moravian College at Bethlehem; he lived from 1806 to 1879. (T. 16: 283.) Rev. Jacob Van Vleck, another fellow Moravian, living from 1751 to 1831, collected plants at both the Salem and Bethlehem headquarters of the sect. (T. 16: 300.) Dr. Frederick Kampman, perhaps also a Moravian, is one about whom we need information; his collections being in New Jersey may indicate that he was not of that fellowship. Matthias Kinn was a picturesque German immigrant, who traveled extensively, even to Florida,[21] and who shipped seeds and plants from Philadelphia to Europe. (B. 9: 38. H. 184.) (Van Vleck, Kampman, and Kinn we have already met among those to whom Muhlenberg felt indebted.) Charles J. Wister, living from 1782 to 1865, was the father of William Wynne Wister. (H. 144.) Dr. Huebener and Charles Kluge were evidently both Moravians, perhaps both teachers at Nazareth Hall. Dr. Barnhart suggests that the former was Abraham Lewis Huebener, 1806-1870, long a physician at Bethlehem. Among the list of " Botanical Correspondents " appears also Correa da Serra, the Portuguese minister to this country whose time was divided between Philadelphia and the new city of Washington; at the former he had substituted for Dr. B. S. Barton in giving botanical lectures at the University of Pennsylvania, and he was a real patron to Nuttall. As he was omitted from the list of " Contributores " I suspect that he made few if any specimens. (B. 16: 23.)

In 1782 was born William Darlington, the preeminent botanist of Chester County, Pennsylvania. As we have seen, he and William Baldwin had studied together at the University of Pennsylvania, taking the lectures of Professor Benjamin Smith Barton. Darlington became physician, representative to the national legislature, and for the latter half of his life banker, botanist, and historian. Throughout its existence, from 1826 to 1850, he was President of the Chester County Cabinet of Natural Science. As historian he edited the letters and other memoranda of his friend Dr. Baldwin, and then went farther back to perform the same service for John Bartram and Humphry Marshall. The

---

[20] Biographical sketches of many of these collectors have been presented by Dr. J. H. Barnhart in Mem. Torrey Bot. Club 16: 290-300, 1921 (abbreviated " T " below), and in Bartonia 16: 19-36, 1935. Other papers concerning Schweinitz are in that issue of Bartonia.

[21] Rafinesque, New Fl. N. Amer. 4: 10, 70, 1838.

" Reliquiae Baldwinianae " was published in 1843 and the " Memorials of John Bartram and Humphry Marshall " in 1849, both so late that one might well look back reminiscently to the great botanical days of Philadelphia's past. But his botanical work was taken up earlier, although his first publication in this field waited until his forty-fourth birthday. As botanist Dr. Darlington confined his studies to the flora of his county, producing in 1826 his " Florula Cestrica ", telling of the plants around West Chester, then in 1837 enlarging his project so as to include in the " Flora Cestrica " those of the whole county. In the former work descriptions are abbreviated, and only one important acknowledgment is made for field help within the county, that to Dr. William Baldwin. In the latter descriptions are as ample as in any flora, critical comments of keen interest are freely inserted, and there are acknowledgments of field assistance to as many as 22 persons. As their observations are dated, we can see that they commence with 1827, thus testifying to the stimulus given by the appearance of the " Florula ". Usually Darlington's entries are to assign credit for the first discovery of species within the county. (* B. 14: 1-13. * H. 134-143.)

To David Townsend there are over 80 acknowledgments, and they show him active in every part of the county from 1828 on. Born in 1787, he was only five years younger than Darlington, and he was associated with him in the West Chester bank. The Academy has some of his specimens, all bearing a form-label giving no locality but simply his own address as West Chester, although his many specimens in Darlington's herbarium and the records quoted by Darlington are always precise as to place. He died in 1858. (H. 163-164.) Next is Joshua Hoopes with 40 acknowledgments. He was but a year younger. His activity commenced in 1827, and many of his specimens were gathered near his boarding school at Downingtown. Later he taught school in West Chester. He survived until 1874. (H. 164-167.) Third is Joseph Rinehart with 22 acknowledgments. His activity only commenced in 1836, the year that Darlington was preparing his text, but his field was a remote and prolific one, the hitherto unexplored country around Pughtown on the Schuylkill River at the northern end of the county. George W. Hall follows with 14 acknowledgments. He was active from 1829 in the eastern part of the county, Goshen, Willistown, Paoli, etc. Those with acknowledgments between 3 and 9 are: Joseph Jacobs, whose collections at Uwchlan, Pikeland, etc., may have been earlier than this time; John (recently deceased) and William Jackson, of London Grove; Miss Abigail Kimber of Kimberton (H. 167.); John Marshall, who collected at Black Rock on the Schuylkill River; Ezra Michener, of London Grove and West Grove, and Samuel Peirce of East Marlborough. Mentioned are also Thomas Seal (1785-1875) of Unionville, whose collections are partly at the Academy in Philadelphia and at the Carnegie Museum in Pittsburgh;[22] and James Trimble of Cecil County, Maryland, just over the state line from Nottingham in Chester County.

---

[22] See Monog. Acad. Nat. Sci. Phila. 1: 619. 1935. For a character portrayal see sketch by Henry Seidel Canby in the Reader's Digest for March, 1941, pages 85-87.

William Darlington published in 1853 yet another edition of the "Flora Cestrica", calling it the third. The work was simplified by omission of such critical discussions as those of 1837, and the dicta of Gray's Manual, then recently published, were accepted as authoritative. Also acknowledgments to collectors were discontinued. An added feature was the inclusion of Mosses and Hepaticae, contributed by Dr. Thomas P. James, and of Lichens by Ezra Michener, both of whom will be considered. Darlington died in 1863, and his herbarium, including also what he had received from various contributors, passed to the Chester County Academy, which is now the State Teachers' College at West Chester. (The herbarium has recently been installed in satisfactory metal cases.) Darlington distributed specimens widely, and there is a good representation of his Chester County collections in the Local Herbarium of the Academy of Natural Sciences.

In 1785 was born Constantine Samuel Rafinesque. A career more utterly in contrast to that of Darlington could hardly be imagined. Versatile, enthusiastic, an incurable wanderer, he appears upon our scene as an immigrant from Italy. In America Philadelphia was repeatedly his home. Hither he came as a youth of nineteen, being ostensibly here from 1802 to 1805 but spending much of his time wandering after scientific material. Then he returned to Europe to spend ten years in Sicily, but in 1815 came to the United States for the remainder of his life. He visited this city again, and in 1818 set forth from Philadelphia on his memorable journey to Kentucky. After teaching from 1819 to 1826 at Transylvania University at Lexington in that state, he returned to spend the last fourteen years of his life in our city. His was indeed a unique career. But before telling of it in relation to our local flora, let us consider that of a man who became surprisingly involved with him. (H. 144-148, an account that needs much revising.)

We have repeatedly had references to Zaccheus Collins. Each of the Philadelphia botanists had expressed their indebtedness to him, and especially does this appear in the younger Barton's "Compendium Florae Philadelphicae", a work that was appropriately dedicated to Collins. Because of the Rafinesque association I have deferred consideration of Collins far beyond his due position, for he was born in 1764, two years earlier than Benjamin Smith Barton. To botanist after botanist he had given freely of his discriminating knowledge of our local plants. Rafinesque repeatedly urged him to publish the many new species in his herbarium—indeed, he even offered to do so himself if Collins would only let him. A greater temperamental contrast than that between the ultra-cautious Collins and the ultra-rash Rafinesque could hardly be imagined.[23]

---

[23] In fact, Collins was far too cautious about his identifications. In a letter of March 22, 1821 Torrey informed Schweinitz that Nuttall had given his Arkansas collection of Cryptogams to Collins for identification, to which Schweinitz replied on April 19th: "I sincerely deplore that [Nuttall's] cryptog. specimens have been swallowed by that retentive gulph, Mr. Collins, going into whose cave so many footsteps may be traced & none coming forth! I have among the rest written to Collins more than once, but have never been blessed with an answer." Mem. Torrey Bot. Club 16: 137, 142, 1921.

Collins was evidently forbearing and gracious to the foreigner, so it was into his ear that Rafinesque poured accounts of his successes and his shifting interests during the years in Kentucky. Unasked he sent Collins some specimens, which the latter refused to purchase. Twice Rafinesque, " broke " financially, appealed to Collins, obtaining money on loan and also good advice which he did not take. At last, after Rafinesque had settled finally in Philadelphia, Collins' health failed and after a lingering illness he died in 1831. Then, to the surprise of his executor, came an itemized bill from Rafinesque for all that he had ever sent Collins, deducting Collins' kindly loans (for which the executor held Rafinesque's signed acknowledgments) as having been advance payments. Rafinesque took the matter to the courts, and so vigorously pressed his claim that at last the executor, to end the matter and doubtless quite unaware of its scientific value, gave Rafinesque Collins' entire herbarium.[24] (B. 16: 23.)

Through his earlier and middle years Rafinesque was constantly afield, and he must have acquired a remarkable knowledge of our plants living. Doubtless it was throughout marred by an over-sanguine belief that everything that looked different would surely prove to be distinct. Yet he often showed keen insight, and built his judgments independently. His early papers were submitted to the scientific magazines of the time, but their sketchy nature and the improbably high proportion of novelties reported led to these avenues of publication becoming closed to him. Then commenced his own struggling ventures in scientific journalism, restricted by his poverty or expanded by his periods of financial success. His " Medical Flora of North America " appeared in 1830, and his greatest work, the " New Flora of America ", from 1836 to 1838. In the introduction to the latter is a geographical outline of our flora, which contains an enumeration of twenty localities that he has " discovered or first well explored ". Among these the following are in our local area: " 1. The neighborhood of Quaker Bridge and Cedar Bridge in the centre of the Pinelands of New Jersey. 2. The neighborhood of Mullica Hill in New Jersey. 3. The sea Islands of New Jersey. 12. The serpentine rocks of Chester and Maryland. . . ." A list of collectors includes hardly a new name from our territory, while almost the only local collector referred to in the text is Dr. Cleaver, already mentioned in connection with Nuttall. Rafinesque's last work, the " Autikon Botanikon ", with five parts that contain a haphazard sequence of descriptions of new species, was issued in 1840. By September of that year he had run through his financial resources, and died in our city in utter poverty.

Elsewhere I am telling the dramatic story of Rafinesque's life,[25] but now we are merely concerned with his herbarium, and what has become of it. It is known that shortly before Rafinesque's death Elias Durand bought it. The latter says: " It is also about that time I purchased the large herbarium of Rafinesque. I did not care much for his own plants. I knew that his specimens were miserable, but he had come to the possession of Mr. Collins' herbarium. . . ." Then he added: " Mr. Collins' collections were to me a most valuable acquisition ".[26] Evidently no care was given to conserving the types of Rafinesque's many species, but Durand's effort was to salvage what he could of Collins' precious herbarium. Rafinesque's later works received only scorn from his contemporaries, and it was then supposed that his proposed new species could be simply ignored, but subsequently, with the coming of precise and impersonal rules of nomenclature, it is realized that every scrap should have been saved that could help to interpret his work. His whole herbarium could have been easily preserved at this Academy, but no one then saw the desirability of such a course. What was saved of it and also what further became of Collins' herbarium we shall see, when we come to consider the career of Elias Durand.

---

[24] The whole story has only recently come to light with the presentation to the Academy of Natural Sciences of the letters from Rafinesque to Collins, as well as other matter from the executor. These were given by members of the Rawle family, a former member of which had been an arbitrator in the case.

[25] Address delivered at Transylvania College, Lexington, Kentucky, at the centenary Celebration of Rafinesque's death, October 30, 1940. Its publication is expected.

Another European, who paid but a brief visit to our territory, was John Goldie. Born in 1793 in Scotland, he came to eastern Canada in 1817 and at Montreal met Frederick Pursh. Later in the year he visited the New Jersey Pine Barrens, and there collected the original specimen of *Agrostis compressa,* described by Torrey in 1824. Returning home in 1818, he revisited America in 1819-22, and finally settled in Ontario in 1844. That his collections figure so little in our taxonomy was due to no lack of zeal, but to a series of accidents that destroyed them. He died in 1886. His name is perpetuated in the fern, *Dryopteris goldiana.*[26a]

Three names yet remain for mention before we pass beyond the Classical Period of Philadelphia botany. One is that of Dr. R. Eglesfield Griffith, who in 1847 was the author of an imposing book on " Medical Botany ". He was born in 1798. From 1829 to 1836 he was one of the three curators of the American Philosophical Society. Inspection of handwriting leads to his being identified as the collector of six boxes of specimens deposited by the Society at our Academy; in these the plants, all from our local territory, are mounted upon small sheets of brown paper. More interesting still, the same hand appears throughout the whole Muhlenberg Herbarium, proving that it was Griffith who brought it into its present order. This may have been at some cost of original data, although Baldwin who saw Muhlenberg's herbarium earlier, assures us that there was never much information with his specimens. Griffith did this about

---

[26] Bartonia 17: 42, 1936.

[26a] Two other Scottish botanists visited Philadelphia about this time, David Douglas in August, 1823 and Thomas Drummond in May, 1831. Douglas tells of his visit in his Journal (pp. 7-9, ed. Hort. Soc., London, 1914), and Drummond in a letter, published in the Journal of Botany 1: 53, 1834, that accompanied a parcel of specimens from this vicinity. Both Douglas and Drummond were famous botanical explorers of western North America, and the latter of Texas as well.

1830, since that date appears on the reverse side of one of the Muhlenberg sheets which the organizer had first purposed using for his own herbarium. He resigned his curatorship at the Philosophical Society in 1836, as he was about to move to Baltimore. He died in 1850.

The second name is that of James Read. Among the contributors to the Schweinitz herbarium he is mentioned as giving plants from the Local Area and from China. Later he presented the Academy specimens gathered in 1837 in the West Indies. Finally, he was mentioned by Durand [27] as having died by 1857, and as being one whose herbarium, presented afterward to the Academy, was a source from which Durand obtained specimens.

The last name is that of Dr. Charles Pickering. For over ten years, from 1827 to 1838, this young man, for he was born as late as 1805, took a keen interest in the Academy of Natural Sciences. Darlington most gratefully mentions his assistance in problems of identification toward the " Flora Cestrica " of 1837. He had earlier collected in New England,[28] but the young physician turned keenly to the study of our flora around Philadelphia. But from this he was drawn in 1838 to become one of the naturalists on Wilkes' Exploring Expedition, and later settled in Massachusetts where he pursued his wide interest in plants in relation to man, developing his great work on " The Chronological History of Plants ". Although he lived until 1878, and was often, in after years an honored guest at the Academy's meetings, Pickering's work on our local flora pertains to the period that closed in 1841. (H. 190-193.)

I set that year for the closing of our Classical Period because it was then that Nuttall left Philadelphia to spend the remainder of his days as an English gentleman. Rafinesque had died the year before. Pickering had set out three years earlier on his scientific voyage, which was not to bring him back to Philadelphia. There was no one left of the old calibre excepting Darlington, but his future work would lack the spirit of what had preceded. Perhaps new leaders would have arisen, had not the remarkable ability that characterized the work of John Torrey in New York and especially of his pupil Asa Gray at Cambridge led to the acceptance of their opinions as possessing an assured finality. So far as the study of flowering plants is concerned the Classical Period of Philadelphia botany closed abruptly while Torrey and Gray's " Flora of North America ", to which Nuttall was a contributor, was in process of publication. Our Philadelphia botanical collectors remain numerous and active, but they look elsewhere for the solution of their taxonomic problems, for the future they are followers. In some new fields however we shall find flashes of the old spirit of original investigation.

Dr. John Torrey himself calls for mention among the botanical collectors of our area because of his teaching at Princeton College from about 1830 to 1855.

---

[27] Proc. Acad. Nat. Sci. Phila. 225, 1857. Bartonia 17: 43, 1936.

[28] Especially about his early home at Salem, Massachusetts. Consultants of the Academy's older collections must distinguish between two places written habitually simply as " Salem "; that in Schweinitz' hand is Salem, N. C., but in Pickering's is Salem, Mass.

Not only then but on an earlier trip into the Pine Barrens of southern New Jersey he collected many specimens within our territory. " A Flora of the Northern and Middle Sections of the United States ", of which the only volume was published in 1824, includes many records from our area. But his main association was with New York state and city, of the former publishing an elaborate flora in 1843 and at the latter preparing his long series of reports on flowering plants of the western United States. He was born in 1796 and died in 1873; his herbarium passed to Columbia College and is now at the New York Botanical Garden.

But as the Philadelphia leader of these botanists of a later time should be mentioned Elias Durand. In 1841 he was forty-seven years of age. He had arrived in this country from France in 1816 and settled as a pharmacist in Philadelphia in 1825. He knew the botanists of that and the succeeding decades. From those times he was building up a large herbarium, and we have already seen how he acquired Rafinesque's and Collins' plants. It was not until 1852 that he could retire from business and devote his remaining life to botany. That was eleven years after Nuttall's departure, and he found the Academy's collections in neglect. To Durand it seemed that the final word upon our species was being said at Harvard, so why attempt to refurbish all these old bundles of dried plants, unmounted as they were then?—better select out a good representative or so of each kind, as that was all that would ever be required for the comparisons to be made at such a secondary herbarium as ours. That this was genuinely Durand's attitude is shown by his formation of such an " Herbarium Boreali Americanum " to be the Academy's working series for temperate North America, a four years' task completed in 1858, and also by this note about the plants of Nuttall that he gave Gray in 1866: " I thought these original species and genera were owing to the herbarium of Dr. Gray, which was to be the standard herbarium of the North Amer. plants."

As to his own herbarium, which on this line of reasoning contained much more than the Academy would ever need, Durand formed a special plan. He would give it to the National Museum of his native country. So, in 1868, after filling out from it whatever was needed for the North American Herbarium of our Academy, he carried most of his rich collection to Paris, and there saw it installed in the Museum d'Histoire Naturelle as the Herbier Durand. The remainder followed after his death in 1873. So for nearly all of Durand's own plants, for those that he could salvage of Collins' herbarium, and for what he chose to save of Rafinesque's herbarium, one must go to Paris, France. With the passage of time it is only the last that we greatly care to see, and in a recent number of BARTONIA Mrs. Chase and I report our luck in seeking there for Rafinesque's types. She found that Durand had saved none of Rafinesque's grasses, while my relative success with Scrophulariaceae was only eight out of sixty species.[29] At our Academy Durand bridged the long interval between Nuttall, the explorer, and Redfield, the conservator. (B. 17: 33-45. * H. 174-178.)

Also born in 1794 but pertaining to this later period was Ezra Michener. He has already been mentioned as a contributor of specimens toward Darlington's " Flora Cestrica " of 1837. To the third edition of 1853 he contributed text also, offering an account of the Lichens of the county. Duplicates of these were given to Darlington, and so are still at West Chester. He assembled a large herbarium of Fungi and Lichens, and in 1857 gave the Academy of Natural Sciences about 1000 specimens of these. Perhaps this was in exchange for specimens from the Schweinitz Herbarium, although the latter may have been due Michener for his task of selecting from that herbarium and mounting in ready reference form a series containing a representative of each species therein. The work on this was done at his home at New Garden, Chester County, from 1855 to 1857. After Michener's death in 1887, his collections passed to his son, Ellwood Michener, also scientifically interested, who eventually placed them at the Bayard Taylor Memorial Library at Kennett Square, Chester County. In 1917 the Fungi were purchased by the United States Department of Agriculture, with the result that there is now in Washington, D. C., a duplicate set of most of the Schweinitz' species.[30] Michener's collections of flowering plants and ferns, after being many years at Kennett Square, have recently been given to the Academy of Natural Sciences of Philadelphia. (H. 178-180.)

Likewise assisting Darlington in the 1853 edition of the " Flora Cestrica " was Dr. Thomas P. James. Born in 1803, most of his long life was spent in Philadelphia, where he was a wholesale druggist. His botanical interest lay in the study of the Bryophyta, mosses and hepatics. Excepting for his contribution on these plants to Darlington's " Flora ", nearly all his important botanical work came late in life, after his retirement from business. Then it was that he and Leo Lesquereux worked together on their " Manual of the Mosses of North America ", a work that was not published until 1884, two years after James' death at seventy-nine years of age. His herbarium is now preserved at the Academy of Natural Sciences of Philadelphia. (H. 186-187.)

Collectors greatly outnumber authors in this later period. Such was Henry Detwiller, born in 1795 in Switzerland and an immigrant in 1817; already mentioned among Schweinitz' " Contributores " before 1830, he was for many years a physician at Hellertown in Northampton County, Pennsylvania, and his large herbarium assembled there has reached the Academy of Natural Sciences since his death in 1887. (B. 16: 24.) So was Samuel Freedly, born in 1799, also mentioned by Schweinitz, also a physician and long a resident of this city, whose large herbarium of some 10,000 specimens was destroyed by fire about five years before his death in 1885. Occasional specimens of his collecting have survived in other herbaria of the time, the fullest series that I have seen being in Darlington's herbarium at West Chester. (B. 16: 25.) So was Dr. Gavin Watson, born in 1795 in Scotland, whose herbarium as mentioned by Durand[31] came to the Academy after his death in 1858; since he is not mentioned by the botanists of the Classical Period, I suspect that he may have come to our city after the 1830s. Durand speaks of the duplicates that he obtained from Watson's herbarium. (H. 246.) Such a list of collectors continues on and on; we must follow its course, and can hardly do better than to follow chronologically. Harshberger's work will be our guide, but there will be some names to add to his record.

---

[29] See articles in Bartonia 17: 33-45, 1936. I have just discovered that Durand gave much of his own and some of Rafinesque's foreign material to William Darlington, and this survives at the State Teachers' College at West Chester, Pennsylvania. Doubtless, he argued that such European material would be superfluous at Paris.

[30] See Shear & Stevens' " The Botanical Work of Ezra Michener ", in Bull. Torrey Bot. Club 44: 547-558, 1917.

Because our area extends farther from Philadelphia than did Harshberger's, our next name is such an addition, Peter D. Knieskern, born in 1798 near Albany, N. Y., resided from 1841 until his death in 1871 in eastern New Jersey. From 1841 to 1847 he lived at Manchester, Ocean Co.; from 1847 to 1843 at Squam, and from 1853 on at Shark River, both in Monmouth County. In 1857 he published a Catalogue of Plants . . . of Monmouth and Ocean [counties], New Jersey.

Dr. George Smith, born in 1804, a physician, published in 1862 a " History of Delaware County ", Pennsylvania. In it is given a list of Delaware County plants, actually collected by the author. He was one of the group that in 1833 founded the Delaware County Institute of Science at Media, and it is fitting that his herbarium is preserved there. He died in 1882. (H. 188-189.)

William Wynne Wister, born in 1807, assembled a large herbarium of the plants around Philadelphia. He lived in Germantown, and many of his specimens are from " Wister's Woods ". His collection passed to the Academy of Natural Sciences after his death in 1898. (H. 196-197.)

Dr. Joseph Carson, born in 1808, a physician, assisted in curatorial work at the Academy of Natural Sciences from 1835 for some years; he became professor at the Philadelphia College of Pharmacy and later in the Medical School of the University of Pennsylvania. His " Illustrations in Medical Botany," five numbers of colored plates with accompanying text, were issued in this city in 1847. Dr. Carson's herbarium, mostly from our local territory, is at the Academy of Natural Sciences. He died in 1876. (H. 199-208.)

Presumably about this time should be entered Samuel Ashmead, who made extensive collections of marine Algae, and whose gifts of these to the Academy from 1852 on were followed after his death in 1864 by his whole herbarium of these plants. Some of these were gathered along our New Jersey coast. He published several papers on Marine Algae in the Academy's Proceedings between 1852 and 1863.

C. G. Ehrenberg, a German student of Algae, who traveled extensively over eastern North America, included records on his collections from the Philadelphia territory in his Papers on American Diatomaceae that were issued in Germany from 1843 to 1854.

---

[31] Bartonia 17: 43, 1936.

Aubrey H. Smith, born in 1815, was a Philadelphia lawyer, who botanized both in our local area and on trips to the western states. His own herbarium, containing many local specimens, was given to the University of Pennsylvania, but his collections are also numerous in the Academy's Local Herbarium. He was one of the first to be intrigued by the search for foreign plants that have reached our port on ballast. He died in 1891. (H. 210-211.)

Oliver R. Willis, born in 1815 on Long Island, evidently lived for some years in New Jersey, and in 1874 published a " Catalogue of Plants growing without Cultivation in the State of New Jersey ", a second edition following three years later. The " Catalogue " gives a simple statement of each species' occurrence but without mention of collectors. An unexpected feature of the work is a " Botanical Directory, for North America and the West Indies ", which includes for our territory most of those mentioned in our account, with certain others whose work may be more briefly recorded in a footnote at this point.[32] By 1874 he was living at White Plains, New York, where he died in 1902. Miss Mary A. Day, in her record of New England herbaria, reports that Willis' New Jersey plants are at Bates College, Lewiston, Maine.[33]

(To be continued)

Euphrasia in Pennsylvania

On August 20, 1940, while driving up the highway from East Stroudsburg toward Hawley, I noticed in barren gravelly places along the road-shoulders and in adjacent fields extensive colonies of an unfamiliar plant. It proved to be *Euphrasia condensata* Jordan, a native of Europe, which was known to have become established in America locally, but had heretofore not been found south of the Adirondack region of New York state. The present locality, at which it is well established, lies just north of Notch Village, about 7 miles northwest of Porters Lake.

EDGAR T. WHERRY

---

[32] Those, who are known to have made herbarium specimens, were from our territory in New Jersey: Miss Carrie A. Boice, of Camden, whose specimens are in the Academy's Local Herbarium; R. Willis Brown, of Keyport, whose collections, mentioned in Britton's " Catalogue of New Jersey Plants ", are presumably at Rutgers University, New Brunswick; Rev. Samuel Lockwood, of Freehold, Monmouth County, whose collections are similarly cited; and George Scarborough of Vineland, whose collections are at the Brooklyn Botanic Garden. (Mary Treat of Vineland, also mentioned, was a prolific writer about flowers, but I know of no specimens collected by her. (H. 298-302.)) From our area in Pennsylvania such were Robert [G.] Bechdolt, of Bethlehem (1848- H. 346-348.), Miss Rachel L. Bodley, (1831-88, H. 283-285.), and Dr. Robert Bridges (1806-82, H. 195-196.) of Philadelphia, Dr. James Darrach of Germantown (1828-1923, H. 258-259.), Robert Kilvington of Philadelphia (1803-81, H. 188.), all with specimens in the Academy's Local Herbarium; and Prof. Traill Green of Easton (1813-97, H. 209.), whose collections passed to Prof. Porter, also of Lafayette College in that city.

[33] Rhodora 3: 69, 1901.

Program of Meetings during 1939

Date	*Subject*	*Speaker*	*Attendance*
Jan. 26	Studies on the Coastal Flora of the Cape May Peninsula	Miss Flora Fender	19
Feb. 23	Two Summer Seasons at Mountain Lake, Virginia	John M. Fogg, Jr.	23
Mar. 23	New Finds of 1938	Edgar T. Wherry	32
Apr. 20	Bicentenary of William Bartram's Birth (Joint meeting with Delaware Valley Ornithological Club)		
	William Bartram's Anniversary	Edward E. Wildman	
	William Bartram as a Zoologist	Witmer Stone	
	A Bartramian Pilgrimage in Georgia	Francis Harper	
	William Bartram's Contributions to Botany	Francis W. Pennell	150
May 25	North to Nain—1936	Walter M. Benner	
	North to the Arctic Circle—1937	E. Perot Walker	30
Sept. 28	Reports by Members on Summer Work		17
Oct. 26	Natural Color Photographs of Pine Barren Plants	John Gill	59
Nov. 16	The Currants and Gooseberries of Pennsylvania	John M. Fogg, Jr.	
	An Inspection of the Herbaria of the Philadelphia Botanical Club and the Academy	B. Long & F. W. Pennell	21
Dec. 21	Field Studies of 1939	Edgar T. Wherry	27

Program of Meetings during 1940

Date	*Subject*	*Speaker*	*Attendance*
Jan. 25	Collecting Plants in Northern Mexico	Francis W. Pennell	32
Feb. 15	Ramblings in New Mexico	J. R. Schramm	22
Mar. 28	Kettle Moraine of Southeastern Wisconsin	Richard W. Pohl	17
Apr. 25	Travels at Home	Howard K. Henry & Robert L. Schaeffer, Jr.	20
May 23	Canada's Eastern Arctic	Roland Holroyd	20
Sept. 26	Reports by Members on Summer Work		13
Oct. 24	Kodachroming across the Continent	Richard W. Pohl	24
Nov. 21	New Light on Rafinesque	Francis W. Pennell	22
Dec. 19	The Phloxes of Twenty States	Edgar T. Wherry	25

Program of Meetings during 1941

Date	*Subject*	*Speaker*	*Attendance*
Jan. 23	Botanical Gleanings along the Bartram Trail	Francis Harper	18
Feb. 27	Recent Studies in the Pennsylvania Flora	John M. Fogg, Jr.	27
Mar. 27	Plant Killers of the Stock Ranges	Walter Steckbeck	10
Apr. 26	Flora of Schuylkill County, Pennsylvania	Paul R. Wagner	12
May 23	A Recent Visit to Jamaica and Central America	M. A. Chrysler	20
Sept. 25	Reports by Members on Summer Work		22
Oct. 23	Beyond the Great Divide: A Phytogeographer in Paradise	Louis C. Wheeler	22
Nov. 19	Wild Flowers at Gladwyne	Mrs. J. Norman Henry	33
Dec. 19	Fiftieth Anniversary of Philadelphia Botanical Club Reminiscences by Morris E. Leeds, Lee Sowden, and Hugh E. Stone Greetings from Torrey Botanical Club, brought by John H. Barnhart Botanical Collectors of the Philadelphia Area, by Francis W. Pennell Camera Studies of Pennsylvania Plants, by Edgar T. Wherry		60

List of Officers and Members, 1939-1941

JOHN M. FOGG, JR., *President*
HARRY W. TRUDELL, *Vice President*
LOUIS E. HAND, *Secretary*, 1939-40
RICHARD W. POHL, *Secretary*, 1941
LEE SOWDEN, *Treasurer*
BAYARD LONG, *Curator*
FRANCIS W. PENNELL, *Editor of* BARTONIA

ACTIVE MEMBERS

(as of February 1, 1942)

	Elected
J. W. ADAMS, 32 Pleasant St., Germantown, Philadelphia, Pa.	1925
MRS. H. C. BARNES, 230 Park Avenue, Swarthmore, Pa.	1942
EDWIN B. BARTRAM, Bushkill, Pa.	1906
J. RUSSEL BEBLER, 135 E. Phil Ellena St., Germantown, Philadelphia, Pa.	1919
DR. WALTER M. BENNER, 5636 Loretta Ave., Frankford, Philadelphia, Pa.	1912
JASPER T. BENTLEY, 7334 Rural Lane, Mt. Airy, Philadelphia, Pa.	1933
CARL E. BLISS, 76 N. Grove St., East Aurora, N. Y.	1924

Carl Boyer, Wagner Institute, 17th St. & Montgomery Ave., Philadelphia, Pa. 1926
Miss Ethel Brubaker, "The Fairfax", 43rd & Locust Sts., Philadelphia, Pa. 1939
Milton Campbell, 4401 Pine St., Philadelphia, Pa. 1928
Lloyd G. Carr, Dept. of Botany, University of Pennsylvania, Philadelphia, Pa. 1942
Miss Marie Chillas, 233 Winona Ave., Germantown, Philadelphia, Pa. 1941
Prof. M. A. Chrysler, Rutgers University, New Brunswick, N. J. 1931
F. Van Buren Connell, 443 Berkley Road, Haverford, Pa. 1924
Palmer DePue, 4209 Longshore St., Tacony, Philadelphia, Pa. 1939
Robert R. Dreisbach, 301 Helen St., Midland, Mich. 1922
Leonard J. Duersmith, 511 Walnut St., Columbia, Pa. 1931
Miss Elizabeth C. Earle, 4209 Chester Ave., Philadelphia, Pa. 1935
Howard W. Elkinton, 6514 Germantown Ave., Philadelphia, Pa. 1931
Mrs. Harold Evans, "Awbury", E. Washington Lane, Germantown, Philadelphia, Pa. .. 1931
Richard Blossom Farley, "Sarobia", Eddington, Pa. 1931
Dr. John M. Fogg, Jr., Dept. of Botany, University of Pennsylvania, Philadelphia, Pa... 1921
Fairman R. Furness, Media, Pa. 1935
John Gill, Haddon Farms, Haddonfield, N. J. 1939
Mrs. Howard L. Godfrey, 7413 Germantown Ave., Philadelphia, Pa. 1935
Louis E. Hand, 8061 Fairview St., Holmesburg, Philadelphia, Pa. 1936
Arthur M. Henry, 416 New Post Office, Atlanta, Ga. 1927
Howard K. Henry, 1464 Grayton St., Penn Wynne, Pa. 1932
Mrs. J. Norman Henry, Gladwyne, Pa. 1932
Miss Josephine de Norman Henry, Gladwyne, Pa. 1938
Miss L. K. Herring, 444 Queen Lane, Germantown, Philadelphia, Pa. 1942
F. F. Huber, Pennsburg, Pa. 1911
Lee P. Hynes, Haddonfield, N. J. 1939
Mrs. Arnold S. Hyatt (Travis), Andover, Conn. 1938
Miss Nancy E. James, 4043 Baltimore Ave., Philadelphia, Pa. 1942
Charles F. Jenkins, Kitchens Lane, Mt. Airy, Philadelphia, Pa. 1934
Miss Clara Kast, 2004 Spring Garden St., Philadelphia, Pa. 1932
Miss Natalie B. Kimber, 538 E. Locust Ave., Germantown, Philadelphia, Pa. 1928
Rev. William U. Kistler, 118 Main St., Pennsburg, Pa. 1911
Prof. W. A. Kline, Ursinus College, Collegeville, Pa. 1911
Charles E. Knopf, 7161 Georgian Road, Philadelphia, Pa. 1931
Ray Kriner, Hershey, Pa. 1939
Mrs. Ida K. Langman, 2316 Delancy St., Philadelphia, Pa. 1937
Dr. Henry A. Laessle, 5900 Market St., Philadelphia, Pa. 1894
Morris E. Leeds, 1025 Westview St., Mt. Airy, Philadelphia, Pa. ....Founder
Dr. Harry A. Lloyd, 200 N. 35th St., Philadelphia, Pa. 1931
Bayard Long, 250 Ashbourne Road, Elkins Park, Pa. 1906
Ernest H. Ludwig, 7904 Buist Ave., Philadelphia, Pa. 1938
Adolph Müller, Box 66, Norristown, Pa. 1920
Mrs. George B. Orr, "Orchard Way", Berwyn, Pa. 1935
Miss Elizabeth G. Ostheimer, Jenkintown, Pa. 1933
Dr. Samuel C. Palmer, 612 Ogden Ave., Swarthmore, Pa. 1929

Dr. Ruth Patrick, Academy of Natural Sciences, Philadelphia, Pa.	1937
Dr. Francis W. Pennell, Moylan, Pa.	1910
Harold W. Pretz, 123 S. 17th St., Allentown, Pa.	1909
Richard W. Pohl, Dept. of Botany, University of Pennsylvania, Philadelphia, Pa.	1940
Robert L. Schaeffer, Jr., 32 N. 8th St., Allentown, Pa.	1938
Dr. J. R. Schramm, Dept. of Botany, University of Pennsylvania, Philadelphia, Pa.	1937
Miss Helen B. Shriver, 2004 Spring Garden St., Philadelphia, Pa.	1935
Henry Skinner, Morris Arboretum, Chestnut Hill, Philadelphia, Pa.	1942
Lee Sowden, 3823 Oak Road, Germantown, Philadelphia, Pa.	1901
Dr. Walter Steckbeck, Dept. of Botany, University of Pennsylvania, Philadelphia, Pa.	1925
Hugh E. Stone, 431 Berkley Road, Haverford, Pa.	1892
J. Fletcher Street, 1120 Locust St., Philadelphia, Pa.	1918
Dr. Robert R. Tatnall, 1100 W. Tenth St., Wilmington, Del.	1928
Arthur H. Thomas, Haverford, Pa.	1928
Horace E. Thompson, 5016 Schuyler St., Germantown, Philadelphia, Pa.	1920
Wm. M. Thompson, Jr., Leroy Court Apartments #403, 1700 S. 60th St., Philadelphia, Pa.	1936
Harry W. Trudell, Wheatsheaf Lane & Coral St., Philadelphia, Pa.	1915
Dr. Paul R. Wagner, Ursinus College, Collegeville, Pa.	1935
E. Perot Walker, 511 Lynmere Road, Bryn Mawr, Pa.	1939
Mrs. Marguerite L. Warnke, 142 S. Logan Ave., Audubon, N. J.	1935
Robert F. Welsh, 325 Chestnut St., Philadelphia, Pa.	1909
Dr. L. C. Wheeler, Dept. of Botany, University of Pennsylvania, Philadelphia, Pa.	1942
Dr. Edgar T. Wherry, Dept. of Botany, University of Pennsylvania, Philadelphia, Pa.	1925
Dr. Edward E. Wildman, 4331 Osage Ave., Philadelphia, Pa.	1931
Hans Wilkens, 241 S. 11th St., Reading, Pa.	1928
William H. Witte, Riegelsville, Pa., R. D.	1898
Miss Mary F. Wright, 538 Locust Ave., Germantown, Philadelphia, Pa.	1928
Carroll E. Wood, Jr., Dept. of Botany, University of Pennsylvania, Philadelphia, Pa.	1942

HONORARY MEMBERS

Samuel N. Baxter, Morris & Abbotsford Sts., Germantown, Philadelphia, Pa.	1918
Dr. Joseph S. Illick, State College of Forestry, Syracuse, N. Y.	1925
Edward Pennock, 243 Harvey St., Philadelphia, Pa.	Founder

CORRESPONDING MEMBERS

Dr. John H. Barnhart, New York Botanical Garden, New York, N. Y.	1936
Otway H. Brown, Cape May, N. J., R. F. D. #1	1908
Stewart H. Burnham, Cornell University, Ithaca, N. Y.	1911
Prof. M. L. Fernald, Gray Herbarium, Harvard University, Cambridge, Mass.	1929
Dr. A. Arthur Heller, Chico, Calif.	1893
Dr. Harold St. John, University of Hawaii, Honolulu, T. H.	1927
Dr. William Randolph Taylor, University of Michigan, Ann Arbor, Mich.	1921
Dr. Campbell E. Waters, Washington, D. C.	1904
Dr. Heber W. Youngken, Massachusetts College of Pharmacy, Boston, Mass.	1918

Index to Species

(New names in **bold-face** type; synonyms in *italic* type. Also includes new varietal names.)

Adiantum pedatum, 20

Amarantus blitoides, 4; blitum, 2, 4; caudatus, 2, 4; crassipes, 2, 4; *cruentus*, 4; deflexus, 4; graecizans, 4; hybridus, 4; lividus, 4; palmeri, 3, 4; pumilus, 2, 3, 4; retroflexus, 4; spinosus, 3; torreyi, 3, 4; tricolor, 2; viridis, 3, 4

Aspidium intermedium, 27

Asplenium bradleyi, 24; *ebenoides*, 1; fontanum, 25, 37; gravesii, 25; montanum, 25; pinnatifidum, 25; platyneuron, 1, 14, 24; p. **hortonae**, 14, 24, 37; resiliens, 24, 37; ruta-muraria **cryptolepis**, 15, 24; r. **ohionis**, 15, 24, 37; trichomanes, 24; trudelli, 25, 37; virginicum, 25

Asplenosorus ebenoides, 1, 25

Athyrium angustum, 26, 37; asplenioides, 14, 27, 37; a. **subtripinnatum**, 14, 27; filix-femina, 37; pycnocarpon, 26; thelypterioides, 26

Azalea arborescens, 5; **furbishii**, 5; prinophylla, 5

Bartramia bracteata, 7

Bignonia *bracteata*, 7

Botrychium dissectum, 17, 37; lanceolatum, 13, 17; matricariaefolium, 17; multifidum, 12, 16, 37; obliquum, 12, 13, 16-17, 37; o., f. **confusum**, 12, 17, 37; simplex, 13, 17-18, 37; virginianum, 13, 18

Camptosorus rhizophyllus, 1, 25, 26

Cheilanthes lanosa, 21

Cryptogramma stelleri, 20

Currania **dryopteris**, 15, 31, 37; **robertiana**, 15, 32, 37

Cystopteris bulbifera, 22; fragilis, 23, 37

Dennstaedtia punctilobula, 20

Dryopteris boottii, 1, 30; campyloptera, 28, 37; celsa, 1, 29; clintoniana, 1, 29, 37; cristata, 1, 29, 30, 37; goldiana, 1, 2, 29; intermedia, 1, 27, 29, 37; **leedsii**, 2; marginalis, 1, 2, 29, 37; **slossonae**, 15, 29, 37; spinulosa, 28, 29, 37

Equisetum arvense, 36, 37; fluviatile, 36; hyemale, 36; laevigatum, 36; litorale, 36, 37; palustre, 36, 37; pratense, 36, 37; prealtum, 36; scirpoides, 36, 37; sylvaticum, 36; variegatum, 36

Euphrasia condensata, 57

Franklinia alatamaha, 6, 7

Isoetes dodgei, 36; echinospora, 35; engelmanni, 35; lacustris, 36, 37; riparia, 36; saccharata, 36

Lorinseria areolata, 22

Lycopodium adpressum, 35; alopecuroides, 36, 37; annotinum, 33, 37; clavatum, 33; complanatum, 34, 37; flabelliforme, 34; inundatum, 34, 35; lucidulum, 33; obscurum, 16, 33-34; selago, 16, 33, 37; tristachyum, 34

Lygodium palmatum, 19

Magnolia pyramidata, 7, 8

Marsilea quadrifolia, 19

Onoclea sensibilis, 22, 37
Ophioglossum vulgatum, 13, 18, 37
Osmunda cinnamomea, 18-19, 37; claytoniana, 18; regalis, 18

Pellaea atropurpurea, 20; glabella, 21, 37; *gracilis*, 20
Pinckneya **bracteata**, 7; *pubens*, 6
Polypodium *dryopteris*, 15; *robertianum*, 15; *virginianum*, 32; vulgare, 32
Polystichum acrostichoides, 30; braunii, 30
Pteretis nodulosa, 21
Pteridium aquilinum, 14, 20

Rhododendron roseum, 5

Selaginella apoda, 35; rupestris, 35

Thelypteris hexagonoptera, 31; noveboracensis, 31; palustris, 31; phegopteris, 31; simulata, 31

Woodsia ilvensis, 21; obtusa, 21
Woodwardia virginica, 22

Index to Persons Considered

Adlum, John, 43; Ashmead, Samuel, 56

Baldwin, William, 39, 42, 44, 45, 47, 48, 49; Barton, B. S., 42-44; Barton, Mathias, 43; Barton, W. P. C., 45; Bartram, John, 6-7, 39-40, 48; Bartram, William, 6-8, 39, 58; Beauvois, Palisot de, 41; Bechdolt, R. G., 57; Beesley, Theophilus, 45; Bodley, R. L., 57; Boice, C. A., 57; Bridges, Robert, 57; Brinton, J. B., 39; Brown, R. W., 57

Canby, W. M., 39; Carson, Joseph, 56; Clayton, John, 38, 40, 42; Cleaver, Isaac, 44, 45, 51; Collins, Zaccheus, 39, 42, 44, 45, 47, 50-51, 52, 54; Conrad, S. W., 39, 46, 47; Correa da Serra, 48

Darlington, William, 39, 44, 47, 48-50, 55; Darrach, James, 57; Denke, Christian, 40, 42, 43, 47, 48; Detwiller, Henry, 47, 55; Douglas, David, 52; Drummond, Thomas, 52; Durand, Elias, 52, 54-55

Eberle, Dr., 45; Ehrenberg, C. G., 56

Freedly, Samuel, 47, 55; Frueauff, E. A., 47, 48

Goldie, John, 52; Green, Traill, 57; Gregg, Dr., 43; Griffith, R. E., 44, 47, 52

Hall, G. W., 49; Hamilton, William, 43; Harshberger, J. W., 39, 40; Herbst, William, 39; Hoopes, Joshua, 49; Huebener, A. L., 48

Jackson, John, 49; Jackson, William, 49; Jacobs, Joseph, 49; James, T. P., 39, 50, 55

Kalm, Pehr, 40; Kampman, Frederick, 42, 47, 48; Kilvington, Robert, 57; Kimber, Abigail, 49; Kinn, Matthias, 42, 47, 48; Kluge, Charles, 48; Knieskern, P. D., 56; Kramsch, Samuel, 40, 47

Lockwood, Samuel, 57; Logan, James, 40

Marshall, Humphry, 39, 40, 48; Marshall, John, 49; Marshall, Moses, 40; Martin, George, 39; Mease, James, 42; Michaux, Andre, 41; Michaux, F. A., 41; Michener, Ezra, 39, 49, 50, 55; Muhlenberg, G. H. E., 39, 41-42, 45, 47, 52

Nuttall, Thomas, 44, 45, 48, 53

Palisot de Beauvois, 41; Peirce, Samuel, 49; Pickering, Charles, 48, 53; Porter, T. C., 39; Pursh, Frederick, 39, 42, 43, 52

Rafinesque, C. S., 42, 48, 50-52, 54, 55; Rau, E. A., 39; Read, James, 47, 53; Rinehart, Joseph, 49

Scarborough, George, 57; Schumann, Walther, 8-10; Schweinitz, L. D. v., 39, 40, 46-48; Seal, Thomas, 49; Smith, A. H., 57; Smith, B. H., 39; Smith, C. E., 39; Smith, George, 39, 56; Steinhauer, Daniel, 47, 48; Steuve, W., 44, 45

Tatnall, Edward, 39; Torrey, John, 53; Townsend, David, 49; Treat, Mary, 57; Trimble, James, 49

Van Vleck, Jacob, 42, 47, 48

Watson, Gavin, 56; Willis, O. R., 57; Wister, C. J., 47, 48; Wister, W. W., 56; Witt, Christopher, 40; Wolle, Francis, 39; Wood, H. C., 39

4/73

No. 22 ✓ 1942-1943

BARTONIA

PROCEEDINGS OF THE PHILADELPHIA BOTANICAL CLUB

CONTENTS

Variation in Phlox floridana . . . . Edgar T. Wherry 1
Quercus incana Bartram . . . . Francis Harper 3
Additions to the Flora of Bucks County, Pennsylvania—III Walter M. Benner 3
Euphorbia serpyllifolia and Aegilops cylindrica in Pennsylvania
Carroll E. Wood, Jr. 5
The "Darlington Herbarium" at West Chester . . . . Robert B. Gordon 6
Botanical Collectors of the Philadelphia Local Area (Concluded)
Francis W. Pennell 10
The Cladoniae of Pennsylvania . . . . W. L. Dix 32
Program of Meetings during 1942 62
List of Officers and Members, 1942 62
Index to Species 65
Index to Persons Considered 66

Published by the Club
Academy of Natural Sciences, Nineteenth and the Parkway
Philadelphia
Issued May 7, 1943

B[illegible]
MISSOURI BOTANICAL
RECEIVED
MAY 18 19[illegible]

BARTONIA

Proceedings of the Philadelphia Botanical Club.

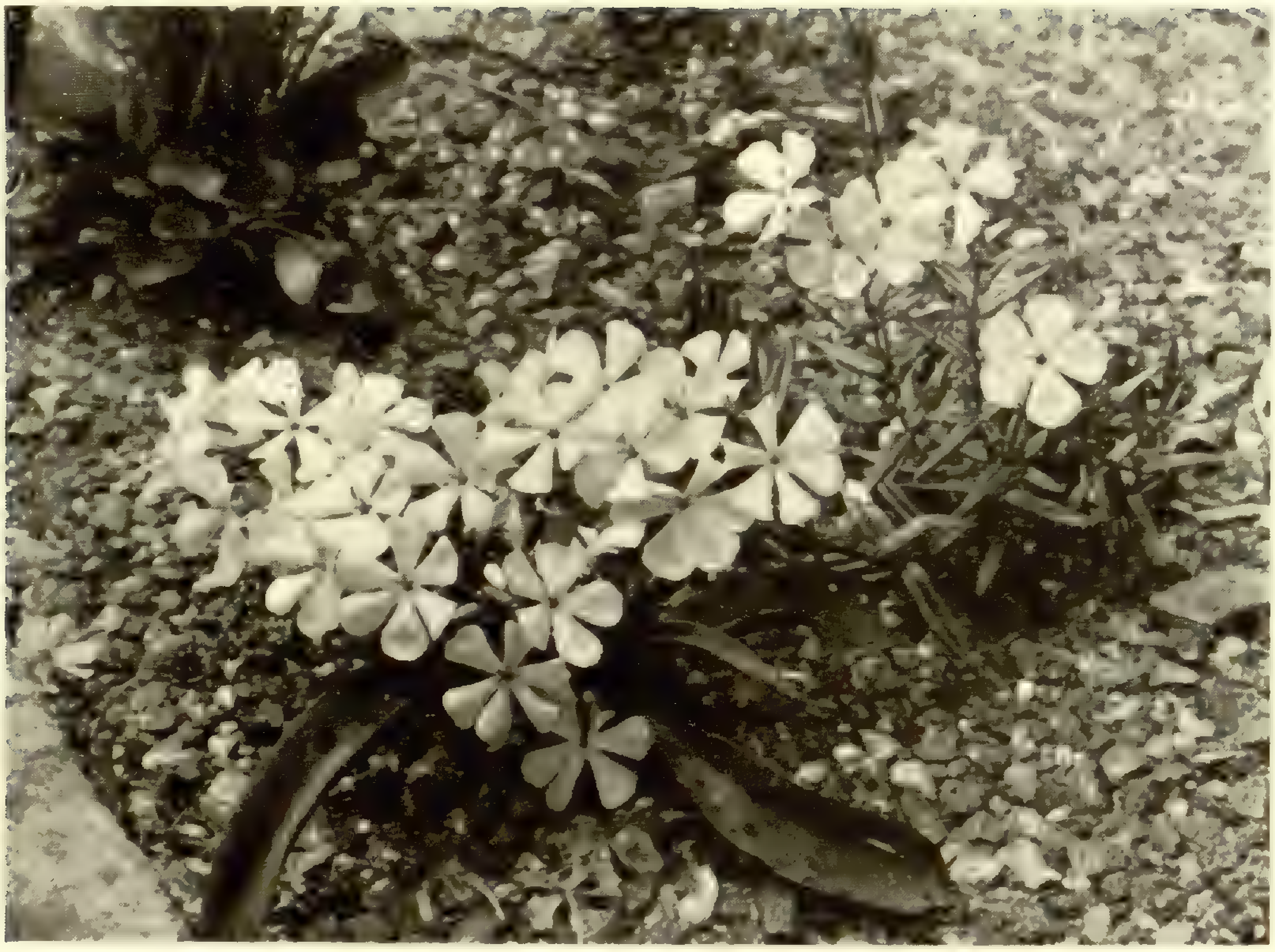
A journal devoted to the Flora of the mid-eastern and southeastern United States, especially of eastern Pennsylvania, New Jersey and Delaware.

Subscription Price, $1.00. Numbers 1-10, 50 cents each; later numbers, $1.00 each.

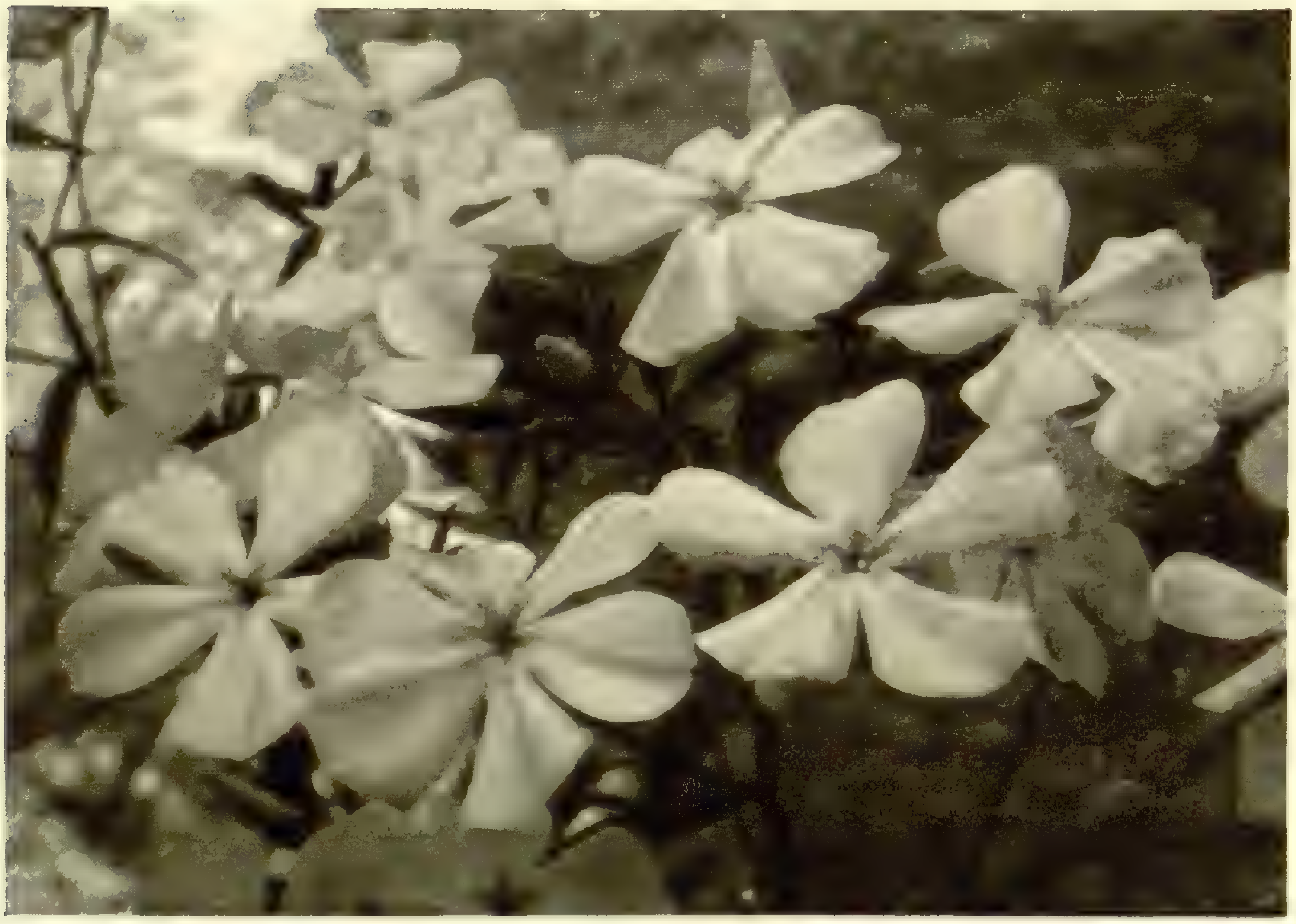
Contributors of articles having four or more pages will receive gratis fifty reprints. Additional reprints, if ordered in advance, may be purchased at cost.

Address
DR. FRANCIS W. PENNELL,
Editor,

Academy of Natural Sciences, Logan Square, Philadelphia, Pa.



Habit of plant, × ¼.



Corollas, natural size.

Phlox floridana bella Wherry, in cultivation at Gladwyne, Pa.

BARTONIA

PROCEEDINGS OF THE PHILADELPHIA BOTANICAL CLUB

No. 22 PHILADELPHIA, PA. 1942-1943

Variation in Phlox floridana

Edgar T. Wherry

When the writer first summarized the features of the Florida Phlox [1] it was known to have been collected in 13 counties of Florida and one each of Alabama and Georgia. Subsequent trips led to the addition [2] of 2 Florida, 4 Alabama, and 7 Georgia counties. In the first-cited article no noteworthy variation was recorded; in the second, the existence of pallid color-forms was recognized.

Recently Mrs. J. Norman Henry has found in Okaloosa County, Florida, a variant of sufficient interest to justify an additional note. For the purpose of comparison, the original representative of the species [3] may be designated *Phlox floridana* **typica**, nomen novum.[4] Data from a photograph of the type obtained from the Kew herbarium and from collections of similar material from many parts of the range, indicate the following features to characterize it:

Stems 40 to 80 cm. long with (12) 15 to 25 nodes; maximum leaf-length 45 to 90 mm. (shown about middle of series of nodes); corolla-color bright to dull phlox-purple, with rarely a few pallid mutants among deep-colored plants.

The new entity differs in averaging lower, with fewer nodes, shorter leaves, and paler corolla-color. If plants exhibiting such features occurred only individually in the midst of extensive aggregations of average ones, they would deserve assignment to the category of form. In this case, however, according to information furnished by Mrs. Henry, a colony nearly an acre in extent was made up wholly of plants with the features noted, showing enough variation to indicate that reproduction from seed was occurring, but no tendency to revert to the typical aspect of the species. Moreover, this colony occurred at the southwestern extremity of the species-range, so assignment to a major species division seems desirable. Because of the beauty of the plant, it may bear the following name:

---

[1] Bartonia No. 12: 48, 1931.

[2] Bartonia No. 16: 41, 1935.

[3] Bentham in DC Prodr. 9: 304, 1845.

[4] A simple trinomial signifies a major subdivision of a species; many progressive taxonomists term this a subspecies, although others, allergic to this term, will prefer to call it a variety.

Phlox floridana bella, ssp. nova.

Stems between 20 and 40 cm. long with 10 to 15 nodes; maximum leaf-length 35 to 45 (–52) mm.; corolla-color lilac to pink; otherwise essentially as in the typical subspecies.

Caules 20 ad 40 cm. longi, nodis 10 ad 15; folia longitudine maxima 35–45 (rarius 52) mm.; corolla lilacina ad rosea; caetera ut in subspecie typica.

Type in herbarium Academy of Natural Sciences of Philadelphia, collected by Mary G. Henry # 1630, June 26, 1939, on sand hills near shore of Boggy Bayou in the town of Valparaiso, Okaloosa County, Florida, latitude 30° 30¼′, longitude 86° 29′. Locality subsequently largely destroyed for military purposes.

A clone with especially large and attractively colored corollas was selected by Mrs. Henry for experiment as to its horticultural possibilities in the middle states, and roots were transplanted into acid sandy soil at Gladwyne, Penna. It has grown well, and proved to be entirely hardy, even during spells of below zero temperature. Its blooming season is unexpectedly long, extending from June to August, and even into October in favorable seasons. Photographs taken there by the writer in July, 1941, (reproduced in plate 1) bring out the aspect of the plant. In cultivation, the stems tend to become somewhat decumbent, yielding low broad clumps; the leaves are dark green and glossy. It can readily be propagated by stem- or root-cuttings. The soil should be dry, sterile, and acid, and north of latitude 40° winter protection by a thin covering of litter may prove desirable. This new Phlox gives every indication of being a valuable addition to the none too large group of late-summer blooming rock-garden subjects.

Quercus incana Bartram

Francis Harper

The lack hitherto of an adequate index to William Bartram's *Travels* (1791) has evidently militated against the recognition of all the available plant names that it contains. One of his overlooked species is "Q[uercus] incana, foliis ovalibus integerrimis subtus incanis" (p. 378). Brief as this diagnosis as, it applies rather unmistakably to the upland willow oak, currently known as *Q. cinerea* Michx. (*Flora Boreali-Americana* **2**: 197, 1803). Consequently Bartram's name must replace Michaux's. The type locality is Warren County, Georgia (probably on or near the Fall Line sand-hills).

Elsewhere in the *Travels* (p. 403) Bartram applies the same name to presumably the same species in Escambia or an adjacent county, Alabama.

Quercus incana Bartram preoccupies *Q. incana* Roxburgh (*Hortus Bengalensis:* 104, 1814), which was proposed for an Indian oak.

Additions to the Flora of Bucks County, Pennsylvania—III

Walter M. Benner

After the publication of the Flora of Bucks County, Pennsylvania, in 1932, two lists of new records appeared in Bartonia 15: 32-34, 1933 and 20: 25-26, 1940. Since their publication six additional species and varieties have been collected or segregated from earlier material. The following annotated list brings up to date all the new county records:

PANICUM TSUGETORUM Nash.

Dry, rocky, open, roadside bank ca. 0.5 mile southeast of Mechanicsville, May 31, 1942, Bayard Long 58305.

This species is widely distributed over the eastern United States. It occurs frequently in New Jersey on the Coastal Plain but in the local range in Pennsylvania it has been collected only in the Blue Mountains near Little Gap, north of Danielsville, Northampton County, by Bayard Long, and near Bakeoven Knob, in Lehigh County, by Harold W. Pretz.

POA PALUSTRIS L.

Monroe, July, 1885, J. A. and H. F. Ruth.

This specimen was recently determined by Mr. Bayard Long. It verifies the published record in Keller and Brown's Handbook of the Flora of Philadelphia and Vicinity 51, 1905.

This in an infrequent grass of moist, open places and has been rarely collected in our local area.

CAREX MESOCHOREA Mackenzie

Border of dry field, just northwest of Mechanicsville, May 31, 1942, Bayard Long 58308.

The above species is based on material which was formerly confused with *C. Muhlenbergii* Schkr., or with *C. cephalophora* Muhl. It has the general aspect of the latter and the perigynia and scales of the former species. (Bull. Torrey Club 33: 441, 1906 and 37: 246, 1910).

This species in the Philadelphia local area occurs in disturbed habitats or closely associated with the works of man and is doubtfully indigenous in Pennsylvania.

JUNCUS EFFUSUS L., VAR. PYLAEI (Leharpe) Fernald & Weigand.

Monroe, July, 1885, J. A. and H. F. Ruth.

This rush was detected recently by Mr. Bayard Long while working over some of the Ruth collections.

This plant is more northern in its distribution than var. *solutus* Fernald and Wiegand, the form commonly found in Bucks County. It was previously known in our local range only from Northampton, Lehigh, Berks and Chester counties.

CUSCUTA CAMPESTRIS Yuncker.

Pleasant Valley, August 15, 1921, Walter M. Benner 1662. Swale, near Delaware River, southeast of Eddington, September 24, 1932, Bayard Long 38540.

Yuncker, in his study of the genus *Cuscuta* realized that the *C. arvensis* of Gray's Man., ed. VII. 672, was based on two different species. These are *C. pentagona* Engelm. and *C. campestris* Yuncker (See Mem. Torrey Bot. Club 18, no. 2: 137. 1932). In my Flora of Bucks County, Pennsylvania four stations were listed for *C. pentagona,* the species with the calyx-lobes broadly overlapping at the sinuses. Recently, Yuncker has made a critical examination of our material and determined the two specimens cited above as *C. campestris.* Both species are widespread but this is more common westward.

PLANTAGO INDICA L.

Stony shores of Delaware River, about 100 yards south of the Pennsylvania–New Jersey bridge at Point Pleasant, August 6, 1939, scarce, Louis E. Hand.

This is *P. arenaria* W. and K. of Britton and Brown, Illus. Fl. Ed. II, 3: 249, 1913. It is an adventive from Europe and occurs chiefly in waste ground and along railroads.

Euphorbia serpyllifolia and Aegilops cylindrica in Pennsylvania

CARROLL E. WOOD, JR.

On September 18, 1941, a species of *Euphorbia* belonging to the subgenus *Chamaesyce* was collected from weedy ground along the Cowanesque River at Westfield, Tioga County, in north-central Pennsylvania. The plant proves to be *Euphorbia serpyllifolia* Pers. var. *genuina* Boiss. which L. C. Wheeler in his recent monograph [1] of the group does not record from the East. In western and central North America, the plant ranges from southern British Columbia and Alberta, south to Mexico, east to western Texas, Colorado, Nebraska, Iowa, Minnesota, Wisconsin, and the Keweenaw Peninsula of Michigan,[2] this last station being presumably the easternmost heretofore recorded. The Pennsylvania occurrence some 500 miles farther east brings the plant deep into the Gray's Manual range, but here seems to represent an introduction of the species, a conclusion suggested both by the disturbed nature of the habitat and by the associated plants, among which were such weedy species as *Polygonum orientale, Amaranthus retroflexus, Brassica nigra, Melilotus alba, Nepeta Cataria, Leonurus Cardiaca, Solanum Dulcamara, Veronica arvensis, Dipsacus sylvestris, Galinsoga ciliata* (Raf.) Blake, and *Erechtites hieracifolia. Euphorbia serpyllifolia* should be added, therefore, to the lengthening list of western plants adventive in eastern North America.

The Jointed Goatgrass, *Aegilops cylindrica* Host., a native of Europe, is said by Hitchcock [3] to be a weed in wheatfields and waste places in Missouri, Kansas, Oklahoma, Colorado and New Mexico. A specimen from Long Island, New York (H. K. Svenson, June 19, 1935) is in the herbarium of the Academy of Natural Sciences of Philadelphia, but the species has apparently been unknown both in the Philadelphia area and in Pennsylvania. However, on June 5, 1942, Mr. W. Herbert Wagner, Jr. and I found a large colony of the grass growing on a weedy embankment in a lumber-yard at Sixty-third and Market Streets, in Upper Darby, Delaware County, Pennsylvania, just beyond the Philadelphia City Limits. The plants were in good condition when collected and seemed to be well established, suggesting that the species will probably persist in this area. Material of this adventive has been placed in the herbaria of the University of Pennsylvania and the Academy of Natural Sciences of Philadelphia as *Wagner and Wood 1977*. *Euphorbia serpyllifolia* is represented in the former herbarium by *Wood 1614*.

BOTANICAL LABORATORY, UNIVERSITY OF PENNSYLVANIA

---

[1] Wheeler, Euphorbia Subgenus Chamaesyce in the U. S. exclusive of southern Florida. Rhodora 43: 97-154, 168-265, 223-286. 1941.

[2] loc. cit., p. 231.

[3] Hitchcock, Manual of the Grasses of the United States, 245. 1935.

The " Darlington Herbarium " at West Chester

ROBERT B. GORDON

(It is important to place upon published record the contents of such smaller herbaria as that of the State Teachers College at West Chester, Pa., so that significant historical material should not be overlooked. This institution possesses at least four series of plant specimens: the herbarium of Dr. William Darlington, author of the " Florula Cestrica " of 1826 and of the " Flora Cestrica " of 1837 and 1853; that of David Townsend; that of Josiah Hoopes; and some more recent local collections. All the three named were residents of Chester County, and are discussed in my current summary of botanists of the Philadelphia territory, Darlington and Townsend in Bartonia 21: 48-50,[1] and Josiah Hoopes in the following article of this issue. Townsend's and Hoopes' herbaria comprise little beyond their own collections, and, as neither were botanical authors, their collections will remain little consulted. Darlington's herbarium is however important not only for its specimens from his beloved Chester County, but because of the large amount of material that he had received from others. This appears to have been during the years of the Chester County Cabinet of Natural Sciences, from 1826 to 1850, when he obtained what collections he could for the Cabinet's Herbarium, presumably merging with it his own herbarium. All these specimens now survive as if part of Darlington's own herbarium. Presumably such was their status after 1850. The Cabinet's records, summarized below, tell of the growth of the Herbarium until 1843, while the supplementary names from the sheets in Darlington's Herbarium as it exists to-day are likely in part those of persons whose collections were received after 1843 or else were included in such entries as that of Elias Durand. (The former seems less likely since it seems that additions were made to the catalog till as late as 1857.)

The following are among the outstanding treasures that have long lain neglected in the Darlington Herbarium: Agardh's series of over 300 specimens of Algae; Cosson & Germain's series of 600 specimens from France and Switzerland; Curtis' series of over 500 specimens from North Carolina; Rafinesque's series, including various new species of the Autikon Botanikon; Reichenbach's many specimens from Germany; and Tenore's series, including some isotypes, from Italy. Historically, rather than scientifically, interesting are the series of over 600 specimens from Dr. Freedley, since his own large herbarium was later destroyed by fire; and the series of over 400 specimens, unfortunately without data of locality and still unidentified, made by Jacob Wolle in Jamaica. —EDITOR.)

In the Twelfth Report of the Chester County Cabinet of Natural Science (March 19, 1842) it is stated that the Herbarium contained " about 7000 plants ". During the preceding year it had been greatly increased through the arrival of 1500 specimens from Elias Durand, 600 specimens from Cosson and Germain, and more than 300 specimens from J. G. Agardh of Lund, Sweden.

---

[1] See also " Dr. William Darlington, Physician and Botanist ", by Dr. William T. Sharpless in Bartonia 14: 1-13, 1932.

Mr. Eric Pennell, one of my students, deserves the credit for thorough examination of the " Catalogue of the Botanical Specimens contained in the Herbarium of the Chester County Cabinet of Natural Science prepared by Wm. Darlington, M.D., *Third Edition*. Commenced Dec., 1842. Finished Feb. 22, 1843. West Chester, Pa." Apparently Dr. Darlington did not list all collections, but only the different species represented, so that the catalogue contains about 3500 entries, according to figures obtained by Eric Pennell. From the Annual Reports of the C.C.C.N.S. from 1830 to 1843 and the herbarium catalogue of 1843, it is possible to make a fair estimate of the contributions made to the Darlington Herbarium which is now located at the West Chester State Teachers College.

ESTIMATED SPECIMENS	COLLECTORS	DATES	LOCALITIES AND NOTES
327	Agardh, J. G. (Lund, Sweden)	1840-44	(Algae)
84	*Baldwin, Wm. (Florida)		(through Durand)
100	Boott, Dr. F. (England)		
257	Brace, John P. (Litchfield, Conn.)		England and France
57	*Bridges, Dr. R. (Philadelphia)		Ferns from Royal Gardens of Berlin
few	Bromfield, Dr.	1848	Isle of Wight
58	Buckley, S. B.		Mts. of Carolina, Georgia, and Alabama
39	Carr, John B.[2]	1826	Bartram's Garden
few	Coates, Josiah		Chester County, Pa.
few	Conrad, C. W.[3]	1833	
600	E. Cosson & E. Germain	1839	France; Switzerland
517	Curtis, Moses A. (Wilmington, N. C.)		
few	Darlington, B.S.B.[4] (U. S. Navy)	1837	Brazil
few	Darlington, J. Lacy[4]	1857	Pa.; Ohio
1090	Darlington, Wm.		Chester County, Pa.
94	DeCandolle, Prof.		Avignon, France
several	Derrick, A. Hamilton		D. C. and Georgia
25	Dobbin(s), Robert A. (Baltimore)		Brazil
1023	*Durand, Elias[5]		Mediterranean Region
46	Elliott, Stephen		South Carolina
73	Engelmann, George		Texas
668	*Freedley, Dr. (Philadelphia)	1830	Moravia; Hungary; Germany
few	Gates, Dr. (Hezekiah) (thru Dr. Torrey)		Alabama; Florida

---

* For accounts of those starred, consult index in Bartonia 21: 64, 1942.

[2] Then owner of Bartram's Garden.

[3] Surely plants of S. W. Conrad; see Bartonia 21: 46, 1942.

[4] Sons of Dr. William Darlington.

[5] The formation and fate of the Durand Herbarium was discussed in two articles in Bartonia 17: 33-45, 1936. Durand had taken what he wished of Rafinesque's herbarium, and Rafinesque had gotten that of Zaccheus Collins, so that it is possible that some plants that reached Darlington had already passed through several hands.

Estimated specimens	Collectors	Dates	Localities and notes
50	Gibbons, Dr. H.		California
few	Gray, Asa		
few	Gummere, Samuel (Burlington)	1826	Philadelphia and vicinity
21	*Hall, George W.	1832	Chester County
994	Hooker, Prof. W. J. (Glasgow)		Over 400 specimens from British Isles
40	*Hoopes, Joshua	1848-52	vicinity of West Chester
60	Jackson, Halliday (West Chester) [6]	1859	New Jersey
few	*Jackson, John		
20	*Jackson, Wm.		from a garden in West Chester
few	*Knieskern, P. D.		New Jersey
66	Lapham, I. A. (Milwaukee)		Wisconsin Terr.
12	Lea, Thomas G. (Cincinnati)		Ohio; Indiana
56	Martins, Dr. Chas. F. (Paris)		France; Egypt
33	Martins et Beauvais, MM.	(1841)	Switzerland
several	McMinn, John	(1842)	Clinton Co., Pa.
several	*Michener, (Dr.) Ezra (New Garden)		Chester Co., Pa., and Delaware State
134	Morris, Miss E. C. (Germantown)		Alabama (Illinois specimens from Miss Dix)
few	*Nuttall (Thomas) (through E. Durand)		Arkansas
few	Pennock, Dr. C. W.	1854	Chester Co., Pa.
33	*Pickering, Dr. Chas.		Massachusetts
44	Porter, Jacob (Massachusetts)		New England
15	*Peirce, Samuel	1833	Cult.
50-60	*Rafinesque, C. S. (through E. Durand) (includes 20-30 genuine "illustrations" of the rare AUTIKON BOTANIKON)		Europe; few from America
24	*Read, James		Georgia and Florida
numerous	Reichenbach, Geo. (through E. Tuckerman)		Europe
92	Riddell, J. L., M.D.		Louisiana; Ohio
154	*Schweinitz, Rev. Lewis D. v. (Bethlehem, Pa.)		Specimens from Dr. Hering, obtained from Weigelt in Surinam
537	Short, Dr. C. W.		Kentucky; Ohio
several	Smith, Mrs. Ann E.		Georgia
25	Steinhauer, Rev. H. D.	1839	Florida (?)
few	*Tatnall, Edward	1842	Delaware
several	Tenore, Prof. (through E. Durand)		Europe
several	Thomas, John R.	1829-31	Chester Co., Pa.
500	*Townsend, David		Chester County
several	Townsend, Washington		Chester County
220	*Torrey, John		U. S. A. (general)
203	Tuckerman, Edward, Jr.		New England (alpine plants)
405	Wolle, Jacob (Bethlehem, Pa.)		Jamaica

[6] See account in following article.

There are numerous other contributors whose names are less well known or whose contributions were only occasional. Mr. Eric Pennell may be able to furnish additional names from his study of the herbarium catalogue prepared by Dr. Darlington in 1843. Additions have evidently been entered since 1843, even as late as 1857, but the main body of the herbarium must have been completed by 1843. The herbaria of Darlington and Townsend have since been combined into THE DARLINGTON HERBARIUM.

Inspection of this Herbarium does yield the names of over fifty more collectors. Only a few of these need be mentioned below. From the early days comes Dr. Muller, who lived at Economy along the Ohio River below Pittsburgh and had furnished specimens to Rev. Henry Muhlenberg. From the middle years that were zealously devoted to Chester County come local collectors like Joseph Reinhart, probably erroneously spelled "Rinehart" in the Flora Cestrica, and Albert Townsend. From other parts of the country are plants of such well known collectors as Berlandier, Bigelow, Fendler, Fremont, Gambel, Geyer, Leavenworth, Lindheimer, and T. C. Porter, of the last from his collections in Georgia in 1846. These were evidently received indirectly. From the third quarter of the century, either late in Darlington's life or after his death, come plants of such collectors as Canby, Commons, Everhart, and Ravenel.

It is timely that this record be published now, just 100 years from the date when the herbarium of Dr. Darlington could properly have been regarded as finished (1842-43).

Botanical Collectors of the Philadelphia Local Area (*Concluded*)[34]

FRANCIS W. PENNELL

A renewal of interest in systematic botany in the Philadelphia area dates from the work of a group of men born between 1815 and 1830. Charles E. Smith first gave close attention to the careful collecting of the local flora. Rev. Francis Wolle, Christian Febiger, Dr. George Martin, Job B. Ellis, and Benjamin M. Everhart developed specialized fields in the study of Algae, Diatoms, and Fungi. At the Academy of Natural Sciences John H. Redfield transformed its neglected botanical collections into an efficient herbarium. Of him I would speak first.

Like Aubrey H. Smith and Oliver R. Willis, already mentioned, Redfield was born in 1815. He came from Connecticut to this city in 1861. Although he had been publishing scholarly papers upon mollusks, on joining the Academy here he gave his attention wholly and zealously to botany. When the institution moved to its present location in 1876 he was appointed Conservator of its newly found Botanical Section. This word admirably expresses the nature of the service that he rendered the Academy during the nineteen years of life still remaining to him. He found its specimens unmounted and tied up in various bundles; with painstaking care he overhauled the whole, seeing that every record possible was preserved, and that the specimens were uniformly mounted on standard sheets of white herbarium paper. From what Gray had called a "dust-bin" there emerged a modern herbarium. Beyond this Redfield gave his funds liberally to supply the Academy with sets of the important exsiccatae of the time. As a collector he gathered plants in various parts of the United States, and with Edward L. Rand he collaborated on a Flora of Mount Desert Island, Maine. Harshberger credits 38 botanical papers to him. But it is as the great conservator that Redfield is to be cherished in memory, and his last act was in keeping with this character. Realizing the need for the indefinite continuance of the purchasing of desirable material, he willed that his own collection be sold so as to provide the Academy with a fund for the acquirement of botanical specimens. On his death in 1895 his herbarium thus passed to the newly founded Missouri Botanical Garden at St. Louis. (*H. 211-219.)[35]

---

[34] Continued from Bartonia 21: 38-57, 1942. Acknowledgments of assistance were then made to Dr. John H. Barnhart and Mr. Bayard Long, and now I would further state my indebtedness to my colleague, Dr. Ruth Patrick, for information concerning students of Thallophyta. She tells me that the German phycologist, C. H. Ehrenberg, was never in this country (as stated on page 56) but had obtained his collections of our Algae from New England and elsewhere; nor are we sure that he had any specimens from the Philadelphia area. Also I am indebted to another colleague, Dr. Walter M. Benner, for information about several collectors.

[35] As explained in footnote 6, these subjoined references bear the following abbreviations and symbol: "B" to Bartonia; "H" to Harshberger's "Botanists of Philadelphia and their Work"; while an asterisk denotes an accompanying portrait.

By the founding of the Botanical Section, one of a group of such sections established at the Academy of Natural Sciences in 1876, another step was taken toward the specialization of scientific work here. The simple club of 1812, with its single room for meetings and collections, had grown to a large institution, caring for vast collections, and with interests so diverse that it seemed desirable for those devoted to each science to meet separately. Fortunately, the old Academy meetings still continued, but, along with them and concerned with the fostering of each science, arose these sections. A parallel development at the University of Pennsylvania had in these years led from the old professorship of natural history to definite chairs for botany, zoology, and geology. Just as had been the case with the founding of the Academy over sixty years earlier, the establishment of the Botanical Section led to a quickened interest in botany at the Academy and in Philadelphia.

To resume our chronological record, Isaac Burk, born in 1816, made a considerable local herbarium, that is said to have included some specimens salvaged from the sale of Rafinesque's effects in 1840, being doubtless ones of Rafinesque's own not wanted by Durand. Burk's herbarium was given to the University of Pennsylvania in 1880. He died in 1893. (H. 220-221.)

Rev. Francis Wolle, born in 1817, was for many years principal of the Moravian Seminary at Bethlehem, Pa. He was a leading authority on freshwater Algae, publishing at Bethlehem three works dealing with these over the whole United States. After his death in 1895 his extensive collections passed to the University of Pennsylvania. A recent evaluation by Francis Drouet of Wolle as a phycologist has appeared in the Field Museum's Botanical Series, 20: 17-23, 1939. (*H. 221-223.)

Christian Febiger, born in 1817 and long a resident of Wilmington, Delaware, assembled a large herbarium of Diatoms that is now at the Academy of Natural Sciences. He sent many specimens to Europe, and a number of species were named in his honor. A list of Diatoms by him was appended to Edward Tatnall's "Catalogue of the Phaenogamous and Filicoid Plants of Newcastle County, Delaware". He died in 1892. (H. 407.)

Halliday Jackson, born in 1817, for many years a teacher in Delaware and Chester counties, Pennsylvania, collected plants locally. After his death in 1887 these passed to Swarthmore College, and have since been deposited at the Academy of Natural Sciences. (H. 223-224.)

Edward Tatnall, born in 1818, lived at Wilmington, and in 1860 published a catalogue of the plants of Newcastle County, Delaware. He died in 1898. His herbarium, historic for that county, was given by his daughter to Colorado College, at Colorado Springs, Colorado. A few specimens from it are at the Society of Natural History of Delaware in Wilmington. (H. 225-226.)

Benjamin M. Everhart, born in 1818, and long resident at West Chester, Pennsylvania, was closely associated in mycological work with Job B. Ellis, their main work together being a study of the "North American Pyrenomycetes" published in 1892. Apparently all his collections went to Ellis. He died in 1904. (H. 227.)

Charles E. Smith, born in 1820, engineer and executive, was an active supporter of the Botanical Section of the Academy of Natural Sciences from its organization in 1876 till his death in 1900. His many collections from our local area are in the Academy's Local Herbarium. Often they are accompanied with pertinent notes of especial interest. (H. 227-229.)

Charles F. Parker, born in 1820, is said by Meehan[36] to have lived as a boy in the same house with Rafinesque. By business a book-binder, he resided from 1853 until his death in 1883 in Camden, and took for his botanical field southern New Jersey. He was for many years a member of the Academy of Natural Sciences, and some of his collections are at that institution, although his large herbarium, rich in plants of southern New Jersey, is at Princeton University.[37] (H. 229-231.)

Rev. Thomas C. Porter, born in 1822 in Huntingdon County, Pennsylvania, was both clergyman and professor of natural science. In the latter capacity he was at Marshall College, Mercersburg, from 1840 to 1853; at Franklin and Marshall College, Lancaster, from 1853 to 1866; and finally at Lafayette College, Easton, from 1866 until his death in 1901. Around each of these centers he collected assiduously. He also visited the Central Rocky Mountain states, and, from his own specimens as well as his identifications of government collections submitted to him, published in 1874 in collaboration with John M. Coulter a "Synopsis of the Flora of Colorado." His interest in the plants of Pennsylvania was to have resulted in a Flora of the state, but the project, left unfulfilled at his death, was carried out in abbreviated form by his nephew, John K. Small. Porter's large herbarium, rich in collections from all parts of temperate North America and Mexico, was deposited by Lafayette College in 1914 at the Academy of Natural Sciences of Philadelphia. (*H. 236-243.)

Mrs. Amelia F. Eby, born in 1823, collected extensively in Lancaster County, Pennsylvania. Her herbarium, presumably after her death in 1908, passed to the Missouri Botanical Garden at St. Louis. It is likely that yet earlier collections, made by the Pennsylvania-German element in Lancaster, Berks, and Lebanon counties, had gone to Dr. George Engelmann, and so eventually to the Missouri Botanical Garden.

Dr. Joseph Leidy, born in 1823, professor of anatomy and biology in the University of Pennsylvania, and long America's leading paleontologist, made an herbarium which passed to the University after his death in 1891.

---

[36] Proc. Acad. Nat. Sci. Phila. 35: 260-265, 1883. This also tells of Parker's encounter in the swamps of Cape May County with Coe F. Austin, the keen student of Hepaticae, who lived so long in Bergen County, in northern New Jersey. Austin made various collecting trips to central and southern New Jersey.

[37] See W. Stone in Rep. N. J. State Mus. 1910: 28, 1911.

Somewhere among the collectors of this time should be mentioned Joseph R. Rhoads, who made a considerable herbarium of plants around Philadelphia that is now at the Academy of Natural Sciences. His specimens are dated about 1860.

Thomas Meehan, born in 1826 in England, came to the United States in 1848. He became a prominent horticulturalist, and, as a member of the Common Councils of Philadelphia, did much to increase its park system. Even before the organization of the Botanical Section of the Academy he was concerned for the welfare of its herbarium, and from that event was an active supporter of Mr. Redfield's work. While very few local specimens of his are at the Academy, he did assemble a considerable herbarium of such plants, which passed after his death in 1901 to the Germantown Botanical Society, and then, after its dissolution, to the School of Horticulture at Ambler, Pennsylvania. (*H. 249-256.)

Dr. George Martin, born in 1827, was a physician of Delaware and Chester counties, Pennsylvania, whose botanical interest turned to the study of Fungi. Of these he assembled through his own collecting and by acquisition from other mycologists of the country a large herbarium which is now at the Academy of Natural Sciences of Philadelphia. His publications, though of high quality, were few. He died in 1886. (*H. 247-248.)

One of the great names in American mycology is that of Job B. Ellis. Born in 1829 in New York State, it was in 1865, just after the Civil War, that he settled in Newfield in southern New Jersey, which became his home through a long and active botanical life. In 1878 he began issuing his extended series of " North American Fungi ", exsiccatae that have become widely distributed; and of which 36 centuries were eventually issued. His work received needed financial aid from the association with B. M. Everhart, and we have already mentioned their joint authorship of " The North American Pyrenomycetes ", published in 1892. Many other mycologists have contributed specimens to the series of " North American Fungi ", among whom Commons forms a third from our Local Area. Ellis' vast herbarium of Fungi, of which Harshberger gives a detailed summary that was copied from Ellis' description in 1892, was bought by the New York Botanical Garden in 1896. Sets of the North American Fungi are at the Academy of Natural Sciences and the University of Pennsylvania. Ellis died in 1905. (*H. 259-272.)

Born in the same year 1829 was another local mycologist, Albert Commons. He lived in New Castle County, and brought together the most ample botanical collections ever assembled from Delaware. His herbarium contained specimens of all groups, flowering plants, ferns, mosses and hepatics, lichens, and fungi, Dr. Harshberger reporting the number of the last as 1300 species. Commons died in 1919, and his nephews have presented his herbarium to the Academy of Natural Sciences of Philadelphia. (H. 272-273.)

Next follows another Delaware botanist, William M. Canby, in many ways a contrast to Commons. Born in 1831 and leading an active business life in

Wilmington, he also collected extensively in Delaware. But his interest was confined to flowering plants and ferns, though geographically it ranged over much of the southern and western United States. Furthermore, Canby did considerable taxonomic work on western species and was on the Northern Transcontinental Survey of 1893. His first herbarium, comprising 30,000 specimens accumulated by exchange from many parts of the Earth, was purchased in 1892 by the New York College of Pharmacy. A later herbarium of some 20,000 specimens passed after his death in 1904 to the Society of Natural History of Delaware, and so is preserved in Wilmington. (*H. 278-283.)

Josiah Hoopes, born in 1832, lived all his life at West Chester, Pennsylvania, where he established a nursery in which conifers were an especial interest. His herbarium, consisting of plants gathered by him in the vicinity of this town and mostly lacking data of locality, is at the State Teachers' College at West Chester. He died in 1904. (H. 285-291.)

Benjamin Heritage, born in 1833, lived all his life at Mickleton, New Jersey. He was a member of the Philadelphia Botanical Club from its founding until his death in 1912. His herbarium, largely representative of Gloucester County, New Jersey, was bequeathed to the George School, at Newtown, Bucks County, Pennsylvania, but many of his collections are also in the Academy's Local Herbarium. (B. 5: 12-13. H. 291.)

Dr. William Herbst, born in 1833, was for many years physician at Trexlertown, Lehigh County, Pennsylvania. His special interest in Fungi led to his work on the "Fungal Flora of the Lehigh Valley". After his death in 1906, his collections of Fungi and Lichens have passed to the Academy of Natural Sciences of Philadelphia. (*H. 291-293.)

The prime mover in founding the Philadelphia Botanical Club, Dr. J. Bernard Brinton, was born in Chester County, Pennsylvania, in 1835. He was a physician and manufacturer. As a botanical collector he worked energetically over the territory accessible to Philadelphia, and it was his custom to conduct "weekly tramps" of a small group of select associates in this study. From this nucleus was organized in December, 1891, the Philadelphia Botanical Club.[38] His death occurred just three years later, and his herbarium was sold to the University of Pennsylvania. (H. 294-298.)

The action of Dr. Brinton and his associates in founding the Philadelphia Botanical Club carried a step farther division of the sciences into specialized fields. Since the Botanical Section of the Academy of Natural Sciences in its zeal for upbuilding the herbarium covered the whole world, it seemed desirable to have a special club for those particularly interested in the Local Flora. Through meetings and field-trips, through the formation of the special club's herbarium, in 1908 through the commencement of the journal Bartonia, this interest has been actively developed over the past fifty years.

---

[38] See Stewardson Brown's "A Brief History of the Philadelphia Botanical Club", in Bartonia 1: 2-4, 1909.

Other more specialized Clubs have followed, some under the aegis of the University and some of the Academy. The Botanical Society of Pennsylvania, founded at the University in 1897, has had a large amateur as well as scientific personnel, and from its membership many collections have come to the University's herbarium. The Leidy Microscopical Club, successor in 1924 to the Academy's Microscopical Department, has fostered the study of diatoms, rotifers, and many other minute forms of both plant and animal life. The Cryptogam Society of Philadelphia, with headquarters at the University, was most active in the first decades of this century, and through it came to that institution many collections including those of mosses and lichens gathered in our area by George B. Kaiser, A. F. K. Krout, Carlotta H. Browne, Josephine D. Lowe, and Virginia Wismer, and of Algae by Almira R. Murphy. Other clubs may have existed, but were shorter-lived. This last stage of evolution into specialized clubs for various fields of botanical interest has been paralleled in the teaching at the University of Pennsylvania by special instruction by specially qualified instructors in the different branches of botany. It has been a long progress from the single professorship of natural history in 1789 to to-day's elaborate staffs for the teaching of botany, zoology, and geology. But we must return to the chronological enumeration of individual botanical collectors.

Dr. Abram P. Garber, born in 1838, was a physician who made some collections in Lancaster and Northampton counties, Pennsylvania, but who is better known for his collections in Florida. He died in 1881. While his specimens exist in various herbaria, including that of the Academy of Natural Sciences, his own herbarium, as I am informed by Dr. H. K. Groff, is preserved at Franklin and Marshall College at Lancaster. (H. 302-303.)

Dr. Isaac S. Moyer, born in 1838, was a physician at Quakertown, who made extensive collections of the plants of Bucks County, Pennsylvania, and in 1876 published a Catalogue of the plants of that county. He died in 1898, and his herbarium has remained at the Bucks County Historical Society at Doylestown.

Professor Austin C. Apgar, born in 1838, was long a teacher of botany at Trenton, New Jersey. He was the author of " Trees of the Northern United States ", published in 1892. After his death in 1908, his herbarium passed to the New Jersey State Museum at Trenton. (H. 304.)

Dr. Joseph T. Rothrock, born in 1839, was a surgeon and botanist, who was on the staffs of several far western exploring expeditions, even visiting remote Alaska. He prepared the botanical report of the Wheeler Expedition of 1873 to 1875 to the southwestern United States. Beginning with 1877 he was Professor of Botany at the University of Pennsylvania. In our territory his collections were mostly made near Philadelphia, and especially in Chester County, Pennsylvania. His own herbarium was purchased by the Field Museum of Natural History in Chicago. Dr. Rothrock's later interest turned strongly to forestry, and for many years he was State Forester of Pennsylvania. He died in 1922. (*H. 305-313.)

Dr. Horatio C. Wood, born in 1841, was a member of the medical faculty of the University of Pennsylvania, whose botanical interest lay in the study of fresh-water Algae. In 1869 he published a "Prodromus of a Study of North American Fresh-water Algae". Since his death in 1919, his herbarium, if it ever existed, has disappeared, a recent vigorous search failing to locate any portion of it.

Benjamin H. Smith, born in 1841, was a son of Dr. George Smith already mentioned as a collector of the plants of Delaware County, Pennsylvania. Although Benjamin traveled extensively in the western United States and lived in Colorado from 1880 to 1887, from his return to Philadelphia in the latter year until his death in 1918 the flora of Delaware County claimed his main attention. His herbarium has come to the Academy of Natural Sciences, and with it some manuscript pages toward a prospective Flora of that county. He was also a keen collaborator of Dr. Charles S. Sargent of the Arnold Arboretum in the field study of *Crataegus*, and a full set of Smith's collections of this genus are in the Academy's herbarium. (H. 413.)

Uselma C. Smith, born in 1841, succeeded Dr. Brinton as the second President of the Philadelphia Botanical Club. He died in 1902, and his collections are in the Academy's Local Herbarium. (H. 319.)

Charles D. Lippincott, born in 1841, was, like Benjamin Heritage with whom he was closely associated, a lifelong resident of Gloucester County, New Jersey, and a collector of its flora. Living so recently as 1926, many of our members will recall his devoted attendance at the Club's meetings. His herbarium was presented in 1924 to our Academy. (B. 10: 53.)

Isaac C. Martindale, born in 1842 at Byberry in Philadelphia, lived most of his life in Camden, New Jersey, where he held a banking position. He accumulated a large herbarium of flowering and flowerless plants, both by his own collecting in our local area and by exchange and purchase; and this herbarium passed, after his death in 1893, to the Philadelphia College of Pharmacy. It includes from our territory, beside his own collections, many specimens gathered by Charles F. Parker. Martindale is especially remembered as a collector of Algae. (H. 322-327.)

Lewis Woolman, born in 1842, became an active student of Diatoms, as a result of his efforts to interpret the stratification found in deep well-borings, especially along the coast of southern New Jersey. Using various groups of plant and animal life, but especially Diatoms, he worked out the successional geologic sequence. He joined the Academy of Natural Sciences in 1884, and died in 1903.

A. F. K. Krout, born in 1843, taught school in various eastern counties of Pennsylvania. For several years he was in Lehigh County, and his specimens therefrom in the Academy's Local Herbarium are recognizable by their unusually large labels. From 1892 until his death in 1914 he resided in Philadelphia, and during these later years turned especially to the study of Mosses. His collections of these are at the University of Pennsylvania. (H. 328-330.)

Joel J. Carter, born in 1843, lived most of his life at New Texas, Lancaster County, Pennsylvania. Keenly interested in plants, he formed a large herbarium from the southern portion of that county. After his death in 1912, this passed to the Academy of Natural Sciences of Philadelphia. In the next year, 1913, there appeared under the joint authorship of J. K. Small and J. J. Carter " The Flora of Lancaster County ". Beside this collaboration, Mr. Carter had also accompanied Dr. Small on several collecting trips to Florida. (B. 5: 11.)

Dr. Clayton D. Fretz, born in 1844, was a physician in Bucks County, Pennsylvania. There he had " read medicine " to Dr. I. S. Moyer, already mentioned, assisted him in obtaining data for his plant catalogue of 1876, and, indeed, fully inherited his interest in the plants of the county. Later, as a result of his own years of collecting, Dr. Fretz issued in 1905 a fuller " Catalogue of the Flora of Bucks County ". He died in 1926, and his herbarium passed to the Academy of Natural Sciences of Philadelphia. (B. 10: 54-55. H. 340-342.)

Dr. George Rex, born presumably in 1845, was a physician of Philadelphia. Keenly interested in microscopic study, he became a leading American authority on the Myxomycetes. However, if the bibliography of 11 titles given by Harshberger be complete, he published relatively little. He died in 1895, and his herbarium is preserved at the Academy of Natural Sciences. H. 342-344.)

Rev. John P. Otis, born in 1846, successively filled charges in Delaware and adjoining Maryland, making at each locality considerable collections of plants. Two of these places were within our local area: Marshallton, New Castle County, Delaware; and Northeast, Cecil County, Maryland. He died in 1934, and his herbarium has been given to the Academy of Natural Sciences of Philadelphia.

Another student of Myxomycetes was Hugo Bilgram. Born in 1847 in Germany, he reached this country in 1869, and in this city became assistant to Joseph Zentmayer, the microscope maker. As a result of fifty years' study he assembled a large and admirably indexed herbarium of Myxomycetes, which on his death in 1932 passed to his friend T. Chalkley Palmer and so to the Academy of Natural Sciences. (B. 14: 55-57.)

William Trimble, born in 1847, a nephew of Dr. George Martin, was for many years a farmer at Concordville in Delaware County, Pennsylvania. His herbarium, mostly from that section, was presented in 1928 to the Academy of Natural Sciences of Philadelphia. He died in 1932. His older brother, Dr. Samuel Trimble (1843-1919), long a physician at Lima in the same county, and a younger brother, Dr. Henry Trimble (1853-1895), were both keen field botanists, but neither seem to have collected specimens. (B. 14: 53-54. H. 363-366.)

William Clark Stevenson, born in 1848, was a Philadelphia business man who made a collection of more than 5,000 specimens of Fungi from Philadelphia, Delaware, and Chester Counties, Pennsylvania. He was a friend and associate of Job B. Ellis. He died in 1919, and his herbarium was sold. (H. 346.)

Eugene A. Rau, born in 1848, was a pharmacist at Bethlehem, Pennsylvania. He made a considerable herbarium, giving special attention to Bryophytes, Lichens, and Fungi. His most extensive publications treated of the first, among these being a "Catalogue of North American Musci", in 1880. In 1928 he presented his herbarium of cryptogamic specimens to the New York Botanical Garden, but his books and some collections of flowering plants came to the Academy of Natural Sciences after his death in 1932. A few years earlier he had given the Academy a series of Schweinitz' books that had come to him, a fellow-Moravian, from the botanist's son. (B. 15: 55-56. H. 352.)

Rev. John E. Peters, born in 1849 at Newark, and both a theological and biological alumnus of Princeton University, after 1876 officiated at Cedarville (1877-79), Mays Landing (1886-89), Pleasantville (1889-90), Elwood (1891-92), and Camden (1893-95), all in the southern part of New Jersey. He was a keen collector of plants, gathering both flowering and flowerless ones, and forming especially large series of Algae and Lichens. After his death at Camden in 1926, his herbarium has come to the Academy of Natural Sciences.

Charles Henry Kain was a teacher in Camden and Philadelphia. He was a collector and student of Diatoms, publishing papers on fossil and recent kinds, including a report for the New Jersey Geological Survey. He cooperated on papers with E. A. Schultze in 1887 and 1889. He died in 1913, and some of his specimens passed to Dr. Albert Mann of the United States National Museum. (H. 350-352.)

Thomas J. Oberlin, born in 1850, collected from 1876 to 1889 in Berks County, Pennsylvania, at which time he spelled his name "Oberly". In 1931 he gave his herbarium to the Reading Public Museum,[39] and duplicates have since been given to the Academy's Local Herbarium. He died in 1936. (B. 19: 55-56.)

Dr. John W. Eckfeldt, born in 1851, a physician of Philadelphia, was a keen collector and student of Lichens. From 1886 to 1895 he published a succession of papers descriptive of new species or reporting on collections made by scientific expeditions to various parts of North America. Failing eyesight led him to discontinue the study, and in 1898 he presented his large herbarium of lichens to the Academy of Natural Sciences. Until some months before his death in 1933 he was a frequent attender of the Philadelphia Botanical Club. (*B. 15: 57-59. *H. 356-358.)

Frank Lamson-Scribner, born in 1851 in Massachusetts, was on the faculty of Girard College in this city from 1877 to 1885, after which came his years of agrostological work in the Department of Agriculture at Washington, D. C. While in Philadelphia he was a collector and student of the local grasses, and also published on these plants from various parts of North America. His collections are in the Grass Herbarium of the United States Department of Agriculture. He died in 1938. (H. 358-363.)

---

[39] Mr. Wilkens, in telling of Oberlin, mentions his association with Dr. Daniel B. D. Beaver, who contributed a list of plants of Berks County to Montgomery's History in 1886 and whose herbarium is also at the Reading Museum. Also he tells us that Oberlin had specimens from Harriet M. Willmarth, of Philadelphia, Pa. and Pemberton, N. J., some of which have also been recently presented to the Academy's Local Herbarium. Her specimens, that are cited in Britton's "Preliminary Catalogue", are presumably at Rutgers University.

Harold Wingate, born in 1852, was a student of Myxomycetes, and published various papers about them in the Proceedings of the Academy of Natural Sciences of Philadelphia. He died in 1926, and his herbarium is at the Academy. (H. 363.)

Henry Dautun, born in 1853, was a collector of flowering plants and ferns in the vicinity of New York, whose excursions extended south to Monmouth County, New Jersey. He died in 1913, and his herbarium is at the Brooklyn Botanic Garden.

Jacob H. Grove, born in 1853, resided many years at New Egypt, near the junction of Burlington, Monmouth, and Ocean counties, New Jersey. He made a considerable herbarium of the plants of that section, which was of much assistance to Witmer Stone's " Flora of Southern New Jersey ", and is now in the Local Herbarium of the Academy of Natural Sciences. He died in 1929. (B. 11: 50.)

Dr. Hugh B. Meredith, born in 1853 in Bucks County, Pennsylvania, was a hospital superintendent on the upper Susquehanna, but from 1920 till his death in 1929 he lived in this city and was an active member of the Philadelphia Botanical Club. He became a zealous collector, and contributed many specimens of unusual beauty to the Academy's Local and General Herbaria. (B. 11: 56.)

Henry A. Lang, born in 1854, was a musician, who found much pleasure in botanizing. He contributed collections to the Academy's Local Herbarium, and made a special series of specimens from the Wissahickon Valley in Philadelphia. He died in 1930, and his herbarium passed to the Academy of Natural Sciences. (B. 12: 54-55.)

Dr. John M. Macfarlane, born in 1855 in Scotland, came in 1891 to the University of Pennsylvania, where he was many years in charge of the Botanical Garden. Here his research has been largely devoted to insectivorous plants, for which he has made repeated journeys to the Southeastern States. Locally, he has established the Botanical Society of Pennsylvania, and, often in association with its members, has made collections for the herbarium of the University. He has the honor of being the oldest living collector on our record. (H. 367-372.)

Charles S. Boyer, born in 1856, a teacher and school supervisor in Philadelphia, was a devoted student of Diatoms and author of a " Synopsis of North American Diatomaceae ", published by the Academy of Natural Sciences in 1927. He was ably assisted by a group of workers at the Academy, including Frank J. Keeley, John A. Shulze, and T. Chalkley Palmer. Boyer died in 1928, and his vast collection of diatoms is now at the Academy of Natural Sciences of Philadelphia. (H. 372-374.)

Charles S. Williamson, born in 1857, was long Profesor of Drawing at Girard College in Philadelphia. He was a zealous collector of plants, and made many botanical excursions to various parts of the United States and Canada. From 1897 until his death in 1914 he was a member of the Philadelphia Botanical Club. His herbarium was given to the Academy of Natural Sciences. (*B. 7: 1-4. H. 374.)

Hiram L. Fisher, born in 1858, has been long a resident of Hunterdon County, New Jersey, and his collections, now at the Academy of Natural Sciences, form our chief representation therefrom.

Joseph Crawford, born in 1858, was a pharmacist in Philadelphia. He was one of the original founders of the Philadelphia Botanical Club, and from 1898 to 1909 served as its president. His collections, made in our local area and on trips to Georgia and Florida, were given to the Academy of Natural Sciences. He died in 1936. (*B. 19: 54-55. H. 376-377.)

Dr. Nathaniel Lord Britton, born in 1859 on Staten Island, had a distinguished botanical career. His earliest considerable work was " A Preliminary Catalogue of the Flora of New Jersey ", issued in 1881 and with an enlarged edition in 1890. The specimens on which this was based are with the New Jersey Geological Survey, at Rutgers University, New Brunswick, New Jersey. Dr. Britton was subsequently the main author of Britton and Brown's " Illustrated Flora of the Northern United States and Canada ", and the founder of the New York Botanical Garden, in the museum of which are his later collections. He died in 1934.

Charles Francis Saunders, born in 1859, became in 1893 a member of the Philadelphia Botanical Club, and contributed many collections to the Academy's herbarium from the local territory and from the mountains of Pennsylvania. On moving to California about 1904, he became an enthusiastic student of the western flora as well. A charming writer, he published various books on western plants, but his " Useful Wild Plants of the United States and Canada ", issued in 1920, pertains to our eastern flora as well. It was my pleasure to meet him at Pasadena in southern California in 1940, about a year before his death.

George M. Beringer, born in 1860, was for many years a pharmacist in Camden, New Jersey. He was one of the founders of the Philadelphia Botanical Club, and served as its third president. He contributed specimens from adjacent New Jersey to the Academy's Local Herbarium. He died in 1928. (B. 10: 56. *H. 377-378.)

T. Chalkley Palmer, born in 1860, for nearly forty years President of the Delaware County Institute of Science and from 1927 to 1928 President of the Academy of Natural Sciences of Philadelphia, had a broad interest in plants of Delaware and Chester Counties, but was most keenly conversant with microscopic forms of vegetation. He assembled a large herbarium of Diatoms and other Algae, publishing upon the former and especially on the Algal genus *Trachelomonas;* also he made collections and published comprehensive studies of the Pteridophyte genus, *Isoetes.* After his death in 1935, his collections of all groups of plants passed to his son, Walter Palmer, who has pursued his father's interests both in the Delaware County Institute and the Leidy Microscopical Club of the Academy of Natural Sciences. (*B. 16: 59-61. H. 378-379.)

Samuel S. Van Pelt, born in 1863, holds a unique position in the regard of the members of the Philadelphia Botanical Club. For ten years, from 1903 to 1913, he was Curator of the Club's Herbarium (the Local Herbarium of the Academy of Natural Sciences for which the Club is sponsor). To this task he brought an enthusiast's devotion, resulting in trip after trip afield, while he showed an artist's skill in the collecting of specimens and in their presentation on the mounted sheet. Van Pelt himself mounted not only his own collections but also all other specimens that came to the Club's Herbarium. The remarkable standard then set has held through the years, and is the basis of our pride in the quality of the material in this herbarium. At each Christmas meeting thirty years ago the wall would be hung with the species new to the Club's territory that had been collected during the year, and it was always a remarkable record of exploration. In the first two numbers of Bartonia, Van Pelt has told of trips to Northampton County, Pennsylvania, in 1908 and 1909. After 1920 he retired from botany, and his death occurred in 1935. (*B. 17: 1-3.)

Calvin L. Gruber, born in 1864, has lived all his life in Berks County, Pennsylvania. For more than fifty years he taught in its schools, being forty-five years on the faculty of the State Teachers College at Kutztown. To this institution he gave most of his botanical collections in 1934, but some of his ferns were given to the American Fern Society and his specimens of *Crataegus* to the Academy of Natural Sciences of Philadelphia. Concerning both these groups he has published studies, and he is the discoverer of several new species of hawthorns. He is now keenly pursuing his interest in ferns, collecting and preparing further reports upon them.

John A. and Harvey F. Ruth, two brothers who lived at Riegelsville, prepared a catalogue of the " Plants of Northern Bucks County ", based upon collections made from 1883 to 1885. William H. Witte, a present botanist living at Riegelsville, says that " from 1886 to 1890, Harvey and I collected the hills and valleys in Durham and NockamixonTwps. together ". He " never saw John ", but tells me that Harvey was born in 1866 and died in 1904. The herbarium of the Ruth brothers is now at the Academy of Natural Sciences.

Dr. Ida A. Keller, born in 1866 in Germany, was long a teacher in the Philadelphia High School for Girls. She was a member of the Philadelphia Botanical Club from 1892, and contributed many local specimens to the Club's Herbarium at the Academy of Natural Sciences. In collaboration with Stewardson Brown she published in 1905 a " Handbook of the Philadelphia Flora ", being a compilation of the records of various collectors in the Club's territory. She died in 1932. (B. 14: 59-60. H. 380-382.)

Witmer Stone, born in 1866, another founder of the Philadelphia Botanical Club in 1891, is often thought of as the last of the school of "all-round" naturalists. After his college days at the University of Pennsylvania, his life was nearly wholly associated with the Academy of Natural Sciences of Philadelphia. There for many years he was Curator of Birds, but his published studies ranged from birds to mammals and plants, in the last field issuing in 1903 an account of the violets around Philadelphia and in 1911 his "Plants of Southern New Jersey".[40] He built up a large herbarium from both New Jersey and Pennsylvania, and from this many specimens were given the Academy's Local Herbarium, although his herbarium itself passed to the University of Pennsylvania. In later years official duties and poor health took their toll, but the last summers of his life passed at Cape May were filled with observation of birds and the collecting of insects. He died in 1939. (B. 20: 33-37.)

Rodney H. True, born in 1866 in Wisconsin, in 1920 succeeded Dr. Macfarlane as Professor of Botany in the University of Pennsylvania. Although his special interest lay in plant physiology, he collected locally and in Maine, giving considerable attention to *Carex*. He died in 1940.

A. Arthur Heller, born in 1867 in Montour County, Pennsylvania, was a student at Franklin and Marshall College at Lancaster along with John K. Small. Together they collected in Lancaster and adjoining counties, these excursions beginning the field-work of both botanists. Heller soon disappeared from our territory, becoming one of the most wide-ranging and active of American collectors, working first in the southern Appalachians, then in Texas, and for most of his life in the western United States. For many years he has lived in California, and it was my pleasure to spend a day with him at Chico in 1940. His publications mostly deal with western plants. His early collections are at the Field Museum of Natural History in Chicago. (H. 382-388.)

Stewardson Brown, born in 1867, was first Conservator (1895) of the Botanical Department, and later Curator of Plants (1900), at the Academy of Natural Sciences of Philadelphia. He was one of the founders of the Philadelphia Botanical Club in 1891, and for its first seven years (1908-1914) editor of its journal "Bartonia". His many local collections are in the Academy's Local Herbarium. As has been mentioned, he was associated with Dr. Ida A. Keller as author of the "Handbook of the Flora of Philadelphia and Vicinity", issued in 1905. Beyond our area Brown made several collecting expeditions to tropical America, but of more significance are those with Mrs. Charles Schaeffer to Alberta and

---

[40] The preface to this work contains a "List of Herbaria" consulted that gives a summary of the main collectors in this territory with the present location of their specimens. These supply the additional names of Elias Diffenbaugh and C. A. Gross ("C. S. Gross"). The former, born in Lancaster County, Pa., was a printer in Philadelphia who collected much in New Jersey in the 1860's, but who moved to Illinois where he died in 1870. His specimens are at the Academy of Natural Sciences. (H. 353, as "Diffenbach".) C. A. Gross lived at Landisville, Atlantic County, N. J., and his herbarium is at the New Jersey State Museum at Trenton. An early New Jersey collector, additional to those mentioned by Stone, is Dr. G. Bischoff, whose specimens, made at Long Beach as early as 1848, are in the Academy's herbarium.

British Columbia that resulted in 1907 in their "Alpine Flora of the Canadian Rocky Mountains". At the Academy he suggested the transfer of all specimens from our Local Area to the Philadelphia Botanical Club's Herbarium, thus making that actually the Academy's Local Herbarium. He died in 1921. (*B. 8: 1-6.)

With this second reference thereto, it may be well to tell of Keller and Brown's "Handbook of the Flora of Philadelphia and Vicinity". This work, which was published by the Philadelphia Botanical Club, gives for each species, not supposedly general in its occurrence with us, citations of records, classifying these under counties and giving for each an abbreviation telling who was reporting it. Some of these contributors gave unsupported records of observations, but others kept specimens as vouchers, most of which are in the Academy's Local Herbarium. As the 37 contributors are supposedly those most active in such distributional interest then, it is well to enumerate them now. Addresses were given, so it becomes possible to group them slightly: from Philadelphia (so equally accessible to Pennsylvania and New Jersey), Stewardson Brown, Joseph Crawford, Thomas S. Githens, John W. Harshberger, Albrecht Jahn, Edwin C. Jellett, Ida A. Keller, A. F. K. Krout, Morris and Arthur Leeds, Alexander MacElwee, Philip Marot, Thomas Meehan, George Redles, C. F. Saunders, Charles Schaeffer, Benjamin H. Smith, Uselma C. Smith, Witmer Stone, E. L. Tenbrook, Samuel S. Van Pelt, Cora S. Ware, Newlin Williams, and Charles S. Williamson; elsewhere from Pennsylvania, Joel J. Carter, C. D. Fretz, William Herbst, Aldrich Pennock, Ferris W. Price, and Samuel and William Trimble; from New Jersey, Millie Abbott, Benjamin Heritage, Charles Lippincott, and Joseph Stokes; and from Delaware, Edward Tatnall.[41] Most of these are elsewhere considered. Of the others Albrecht Jahn, who died in 1905, is well represented by specimens in the Academy's Local Herbarium, and he was the artist of the excellent likeness of Dr. Brinton accompanying the first issue of Bartonia; Dr. Thomas S. Githens, a research physician with the Mulford Laboratories at Glenolden, Pa., presented his herbarium before 1911 to the Academy of Natural Sciences; Edwin C. Jellett wrote a "Flora of Germantown" and some specimens of his survive at the School of Horticulture; George Redles, who died in 1937, was an active member of our Club and of the Germantown Horticultural Society, and there are specimens of his in the Academy's Local Herbarium (B. 19: 59.) Dr. Joseph Stokes, whose herbarium is mentioned in Dr. Stone's "Plants of Southern New Jersey", is a physician still living at Moorestown, New Jersey, and who is now presenting his herbarium to the Academy; and Newlin Williams made a considerable herbarium from Bucks County, Pennsylvania, that is now at George School, at Newtown in that county; whether Millie Abbott, Philip Marot, Aldrich Pennock, Ferris W. Price and Cora S. Ware made actual specimens I do not know.

---

[41] Evidently referring to his published Catalogue of 1860.

Dr. John W. Harshberger, born in 1869, was long associated with the botanical department of the University of Pennsylvania. His botanical collections, including many from our Local Area, are in the University's herbarium. His interests ranged widely, and his most characteristic work lay in the special field of ecology. Several such papers concern our local flora, in New Jersey treating of the plants of the coast and of the Pine Barrens, and in Pennsylvania giving a general phytogeographic sketch of our territory and in some detail an account of the plant formations of the Nockamixon Rocks. Vastly wider in scope was his comprehensive " Phytogeographic Survey of North America ", published in 1911 in Germany, in which our local territory received incidental consideration. But the work which the present writer believes will be most permanent is his book on " The Botanists of Philadelphia and their Work ", published in 1899, which has already been alluded to as a mine of originally obtained information. Dr. Harshberger died in 1929. (B. 11: 51-55. H. 391-399.)

Dr. Calvin Henry Kauffman, born at Lebanon in 1869, was from 1904 until his death in 1931 on the botanical staff of the University of Michigan. He was one of the leading American students of Fungi. His collections of these included specimens from the inland counties of our area in Pennsylvania.

Alexander MacElwee, born in 1869, immigrated from Scotland in 1883, and much of his subsequent life was spent in horticultural work near Philadelphia. He joined the Philadelphia Botanical Club in 1892. At intervals he held curatorial posts in charge of the Martindale Herbarium at the Philadelphia College of Pharmacy, and then of the later disbanded herbarium of the Commercial Museum. He amassed a large herbarium of his own, which he sold to the Academy of Natural Sciences in 1905. In later years, while too busy to assemble another herbarium, his botanical interest led to his being President of the Philadelphia Botanical Club from 1918 until his death in 1923. (*B. 9: 1-6. H. 399-401.)

Dr. John K. Small, born in 1869, passed his early life in Lancaster County, Pennsylvania, and we have already told of his early excursions with A. A. Heller when both were students at Franklin and Marshall College. Through his mature years Dr. Small was on the staff of the New York Botanical Garden, and was the leading authority on the plants of the southeastern United States, of which he published his " Flora " in 1903 and his " Manual " in 1933. One of his early tasks was arranging for the press his uncle Thomas C. Porter's notes on the " Flora of Pennsylvania ", which appeared in 1903; and later he returned to his early interest in Lancaster County, when in association with Joel J. Carter he produced a " Flora of Lancaster County ", published at Lancaster in 1913. Dr. Small's early herbarium, containing many of his Lancaster County records, was sold to the Field Museum of Natural History, but his later collections are all at the New York Botanical Garden. He died in 1938.

Dr. Robert R. Tatnall, born in 1870, long a professor of physics at universities in Illinois and New York, returned in 1919 to Wilmington, Delaware, where he has become curator of the herbarium of the Society of Natural History of Delaware. In 1928 he joined the Philadelphia Botanical Club, of which he was secretary from 1932 to 1939. Building upon his uncle Edward Tatnall's list of the plants of Newcastle County of 1860, he has enlarged the project and is collecting specimens toward a record of the plants of the entire peninsula of Delmarva.

Arthur N. Leeds, born in 1870, was, with his older brother Morris E. Leeds,[42] among the founders of the Philadelphia Botanical Club in 1891. For nearly fifty years he served as the Club's Treasurer. After his retirement in 1928 from an active business life he became curator of the Academy's collections of Pteridophyta, the ferns and fern-allies; these he put into good reference-order and increased by many collections. His own field-trips extended widely over the eastern United States, and among his specimens were many from our local area. His death in 1939 was the most severe of our Club's recent losses. (*20: 30-32. H. 402.)

Dr. Charles H. LaWall, born in 1871, was long Dean of the Philadelphia College of Pharmacy, and after his death in 1937 his large herbarium passed to that institution. In it were many local plants, especially from southern New Jersey. In later years he lived near Atlantic City, and contributed plants of that section to the Academy's Local Herbarium.

Hugh E. Stone, born in 1871, long a resident of Coatesville and recently of Haverford, has been especially interested in the flora of Chester County, Pennsylvania. For his cousin Witmer Stone's " Plants of Southern New Jersey " he prepared sketches depicting many species, and a more comprehensive series of drawings is now being made illustrating the plants of Chester County. In Bartonia for 1929 he presented " A Centennial View of the Chester County Flora ", comparing what is known to-day with what Darlington knew a century ago; he is now engaged on a more detailed account of the county's flora. To the Academy's Local Herbarium he has contributed many specimens from Chester County as well as other parts of our Local Area.

George W. Bassett, born in 1871, was long a nurseryman at Hammonton, southern New Jersey. Both he and his elder brother, Frank L., collected plants, and specimens of both from southern New Jersey are in the Academy's Local Herbarium. Frank L. Bassett died in 1897, but George lived longer and became botanically better known. He was a member of the Philadelphia Botanical Club, and contributed to Bartonia in 1911 and 1912 sketches of travel and collecting in the Pine Barrens. From 1922 to 1928 he was an assistant in the Academy's Local Herbarium. He died in 1932. (B. 14: 58.)

---

[42] Of the original group Morris E. Leeds remains after a half-century the only surviving active member. Edward Pennock, founder, was long out of the Club's membership, and is now an honorary, rather than active, member.

William H. Witte, born in 1873, lived many years in Camden, N. J., but since 1937 has resided in Springfield Twp., Bucks Co., Pa. He has collected especially in southern New Jersey, at stations in the Pine Barrens and with Witmer Stone and O. H. Brown on Cape May. By collection and exchange he has built up an herbarium of 10 to 12,000 sheets, that is eventually to pass to Rutgers University.

Dr. Henry S. Conard, born in 1874, was student and instructor of botany at the University of Pennsylvania, where he prepared his revision of *Nymphaea* and also collected some local plants, though few of his specimens are in the University's Herbarium. Since 1906 he has been professor of botany at Grinnell College, Iowa, and of recent years has given his attention largely to mosses.

Dr. Harlan H. York, born in 1875 in Indiana, has since 1930 been giving instruction in plant pathology at the University of Pennsylvania. He is the author of many papers, and has assembled a large private herbarium of Fungi.

Dr. Ernest M. Gress, born in 1876, was for many years State Botanist of Pennsylvania. He has been especially interested in grasses, about which in the state he has published a special bulletin. He has collected in various parts of Pennsylvania, and has built up a considerable herbarium at the Pennsylvania State Museum at Harrisburg. A unique feature is a large collection of seeds of native plants.

Otway H. Brown, born in 1877, is a horticulturalist, long resident at Cape May, New Jersey, and a keen student of the Cape May flora. Many of his specimens therefrom are in the Local Herbarium of the Academy of Natural Sciences. He has assembled, by collection and exchange, a large private herbarium.

Walter H. Leibelsperger, born in 1877, has supplied to the Local Herbarium of the Academy many specimens from Berks County, Pennsylvania.

Kenneth K. Mackenzie, born in 1877 and early living in Missouri, had in later life a legal office in New York City, with residence at Maplewood, in northern New Jersey. He became America's leading authority on the large and critical genus *Carex;* and about this genus his posthumous work has recently appeared. It is illustrated by the Philadelphia artist, H. N. Creutzberg, with unusually accurate and attractive drawings, many of which are from specimens in the herbarium of the Academy of Natural Sciences of Philadelphia. Mackenzie was keenly interested in the flora of the state of New Jersey, collecting mostly in its northern half, but extending his trips to various portions of the southern half also. His collections are at the New York Botanical Garden in New York City. He died in 1934.

Harold W. Pretz, born in 1877, a lifelong resident of Allentown, has made such an extensive study of the flora of Lehigh County, Pennsylvania, as to make it one of the most thoroughly known county units in the United States. His collections are most fully represented at the Academy of Natural Sciences of Philadelphia. In the Bulletin of the Torrey Botanical Club for February, 1911, Pretz commenced a series of notes on this county's plants, but only a single part, that on the Pteridophytes, was published.[43]

Edwin B. Bartram, born in 1878, a descendant of John Bartram, joined the Philadelphia Botanical Club in 1908 and soon became one of the most active collectors in the Philadelphia territory. Soon after 1920 he retired from business in Philadelphia, and made his home in Bushkill, Monroe County, Pennsylvania. Then he commenced the study of mosses, and in 1926 gave his large herbarium of flowering plants and ferns to the Academy of Natural Sciences so as to devote his whole attention to this new interest. He has since become one of America's leading authorities on Bryophytes, publishing reports on these plants from various parts of the World.

Joseph H. Painter, born in 1879 at Chad's Ford, Pennsylvania, became an assistant curator at the National Museum in Washington, D. C. Although best known for his collections in Mexico, he made considerable collections in our Local Area, some of which are now at the United States National Museum. His own herbarium, after his untimely death in 1908, was given to Westtown School in Chester County, Pennsylvania.[44]

William A. Poyser, born in 1882, was a keen student of Pteridophytes, concerning which he published a number of papers on our local species. His Pteridophyte collections are amply represented in the herbarium of the Academy of Natural Sciences of Philadelphia. Poyser also collected Algae, and especially Diatoms. He died in 1928, and his Diatom herbarium is now at the New York Botanical Garden. (B. 11: 49-50.)

Norman Taylor, born in 1883, made collections in at least Monmouth and Ocean counties, New Jersey, in preparation for his " Flora of the Vicinity of New York ", a work covering the counties within 100 miles of New York City, thus embracing all New Jersey, and southeastern Pennsylvania to the western limits of Chester and Berks counties. These collections are at the New York Botanical Garden, and this study was published in 1915 by that institution. Taylor's later collections, largely concentrated on Long Island, are at the Brooklyn Botanic Garden.

---

[43] In it is a summary of collectors in Lehigh County, among whom are especially mentioned C. F. Beitel (approximately 1830 to 1865), whose specimens, without data, are at Muhlenberg College; Durand, Schweinitz, Rau, Huebener, Porter, Krout, and Herbst, already mentioned; Philip Dowell (1864-1936), for a while at Muhlenberg College, and who later assembled a large herbarium, giving especial attention to the critical genus *Viola;* and Daniel W. Hamm, C. N. Lochman, and Charles C. Bachman, from all of whom there are collections at the Academy of Natural Sciences. The last has collected especially in Northampton County, Pennsylvania.

[44] Westtown School, under care of the Society of Friends, has a small herbarium, with specimens mostly from adjacent Pennsylvania. As the school dates from 1799, it is not surprising that some of these were gathered over a hundred years ago. To the early and middle portions of the last century belong those collected by Davis Reece between 1826 and 1859, and smaller series from William Darlington, Benjamin Hoopes, Ann Fothergill, George M. Trimble, Edward Tatnall, William M. Canby, and Samuel Alsop. Beside the herbarium of Joseph Painter, later collections have come from Henry S. Conard and Alfred S. Haines, two former teachers, and in 1940 from a student, Edward E. Terrell. See account by Robert R. Tatnall of " The New Westtown Herbarium " in The Westonian, 47, no. 3: 4-6, 1941.

Dr. Edgar T. Wherry, born in 1885, is on the botanical staffs of both the University of Pennsylvania, where he teaches plant ecology, and of the Academy of Natural Sciences, where he has succeeded Arthur N. Leeds as curator of the herbarium of Pteridophyta. Starting from a study of distribution as chemically and geologically controlled, he developed a keen interest in ferns, orchids, and the Phlox family, Polemoniaceae. He is the author of a " Guide to Eastern Ferns ", published at Philadelphia in 1937, with a second edition in 1942; and of a series of studies of eastern Polemoniaceae, that appeared in Bartonia from 1929 to 1934. He is an enthusiastic flower photographer, and each year the Philadelphia Botanical Club awaits with interest his exhibition of colored lantern-slides of the season's acquisitions. An ardent field-botanist, he has made botanical journeys over much of the United States.

Bayard Long, born in 1885, joined the Philadelphia Botanical Club in 1906, and from that time to the present has remained the most active field-botanist within our Philadelphia area. He succeeded Van Pelt as Curator of the Club's Herbarium in 1914, and has well sustained his predecessor's record for beautiful and scientifically satisfactory specimens. He is an Associate Curator of the Academy of Natural Sciences. His knowledge of our local flora, both taxonomically and geographically, is the most thorough ever achieved, while the numerous specimens being added year after year to our herbarium will remain a priceless record of the flora of the present period. These include flowering plants, ferns and mosses. To Bartonia he contributed in 1924 and 1929 summaries of what new species, appearing since the last editions of the leading manuals, have been discerned in our Local Territory. Beyond our area Mr. Long is the chosen companion of Professor Fernald of Harvard University on his trips to eastern Canada and Newfoundland, and more recently to Virginia.

Dr. Francis W. Pennell, born in 1886, is the writer of these notes. In 1905 and 1906 he was a student-assistant in the herbarium of the Academy of Natural Sciences, and supplied some collections from Delaware and Chester Counties, Pennsylvania. In 1908 and 1909 he made extensive collections toward a Flora of the Serpentine Barrens of these counties, that was published in the Academy's Proceedings for 1910 and 1912; and these specimens are in the Academy's herbarium. From 1911 to 1914 he studied the " Gerardia " group of the Scrophulariaceae, the collections of this period being at the University of Pennsylvania. From 1914 to 1921 during his service at the New York Botanical Garden, he gathered for the herbarium of that institution many specimens from the Philadelphia local flora, among which are those that contributed toward the account of " The Scrophulariaceae of the Local Flora "[45] that appeared in Torreya in 1919 and 1920. From 1921 he has been Curator of Plants at the Academy of Natural Sciences; in the early years he gave some attention to collecting miscellaneous local plants, the study of which led to accounts in Bartonia of certain problems from the Serpentine, etc., but in later years he has given attention nearly wholly to the single family Scrophulariaceae from various parts of the World. Local records enter extensively into his account of this family from eastern temperate North America, that was published in 1935 as a Monograph of the Academy.

---

[45] " Local Flora " here means the combined local territories of the Torrey and Philadelphia Botanical Clubs.

Dr. Walter M. Benner, born in 1888, a school-teacher in Philadelphia, has made an especial study of the " Flora of Bucks County, Pennsylvania," his book so entitled being published in 1932. He is a Research Associate of the Academy of Natural Sciences, and his collections are at that institution.

Robert R. Dreisbach, born in 1888, is a chemist who joined the Philadelphia Botanical Club in 1922. He collected ardently in our local territory, especially in southern New Jersey, from which he contributed many specimens to the Club's Herbarium. In 1927 he removed to Michigan, but still remains an active member of the Club. At various times he has sent Michigan plants to the Academy's herbarium, but of recent years his collecting has become chiefly entomological. (It was my pleasure to visit him at Midland in 1937, and to see his large and growing insect-collection.)

Emory C. Leonard, born in 1892, is on the botanical staff of the United States National Museum at Washington, D. C. Some years ago he was associated in the study of the biota of Haiti with the late Philadelphia zoologist, William L. Abbott, and also made considerable collections of plants on Dr. Abbott's estate on Elk Neck, Cecil County, Maryland. After a long life of zoological exploring and collecting in many parts of the World, Dr. Abbott had retired there, and he himself prepared therefrom and gave to the Academy's Local Herbarium a series of excellent specimens. Dr. Abbott died in 1936.

Dr. William Randolph Taylor, born in 1896, was instructor of botany at the University of Pennsylvania, leaving in 1930 to join the botanical staff of the University of Michigan. His special interest is the study of Algae, and he has published extensively on the marine species. Before 1930 he put in order the Algal collections of the University of Pennsylvania and the Academy of Natural Sciences, contributing to the former many of his own collections. Some of these were obtained within our area.

Dr. John M. Fogg, Jr., born in 1896, joined the Philadelphia Botanical Club in 1921, and from 1935 to 1940 was its President. As a member of the botanical faculty of the University of Pennsylvania he has for more than ten years given courses on the Local Flora, and has assigned to his students certain local problems[46] or the formation of county lists of plants. For his own personal county he selected some years ago Salem County, New Jersey, from which he has added many specimens to the University's and the Academy's herbaria. Recently he and his associates have undertaken the large project of a Flora of the state of Pennsylvania, which, under the auspices of the University, is being developed on a plan of cooperation with every botanical institution and nearly every isolated collector in the state.[47] The completion of this project is being eagerly awaited.

---

[46] In 1934 Miss Esther L. Larsen explored the marshes along Delaware Bay in Newcastle and Kent counties, Delaware, and her study of the " Distribution of *Lilaeopsis chinensis* in Delaware " appeared in Bartonia, no. 16, issued in 1935. In 1935 and 1936 Miss Flora S. Fender made extensive collections of the plants of the coastal island on which are located Avalon and Stone Harbor, and her study of " The Flora of Seven Mile Beach, New Jersey " appeared in Bartonia, no. 19, issued in 1938. Both collections are in the University's Herbarium.

Hans Wilkens, born in 1898, lives at Reading, and has contributed to the herbarium of the Philadelphia Botanical Club, of which he is a member, many specimens from Berks County, Pennsylvania.

Joseph W. Adams, born in 1906, now with the Morris Arboretum of the University of Pennsylvania, has contributed many local specimens to the Club's Herbarium, especially from Cumberland County, New Jersey. He has long had special interest in aquatic plants.

Dr. Ruth Patrick, born in 1907, Associate Curator of the Microscopical Department of the Academy of Natural Sciences, is giving main attention to the study of fresh-water Diatoms from various parts of the Earth. She has collected much within our Local Area.

Miss Grace M. Tees, from 1930 to 1938 Assistant in the Herbarium of the Academy of Natural Sciences, put in order a large proportion of the Bryophytes that had long been awaiting attention, at the same time contributing many of her own collections, largely made within our Local Area.

Robert L. Schaeffer, Jr., born in 1917 at Allentown and now a graduate student at the University of Pennsylvania, is making extensive collections of local plants, especially from Northampton County, Pennsylvania, these being contributed to the Local Herbarium of the Academy of Natural Sciences. He has given valuable information about collectors in that county.

It is difficult to close this list of collectors. Other names occur, with claims for inclusion. Thus, for a few years William C. Steere, and then Frederick J. Hermann, were on the staff of Temple University, and collected in our area; both were later associated with the University of Michigan, where the former has become an important bryologist, but the latter is now with the herbarium of the United States National Arboretum in Washington, D. C. Another former Philadelphian and member of our Club is Guy G. Nearing, who a few years ago moved to Ridgewood, Bergen County, New Jersey. (In Torreya, commencing with the issue for April, 1939, he has been bringing out a "Guide to the

---

[47] This is bringing to the herbarium of the University of Pennsylvania large collections from all parts of the state. Within our Local Area collectors often contribute to both it and the Academy's Local Herbarium, which is that of the Philadelphia Botanical Club. Thus, Mrs. Louise F. A. Tanger, who is actively collecting in Lancaster County, has given to both, though her most extensive collections are at the Academy. Similarly, Dr. David Berkheimer and W. G. Brumbach, collecting in Berks County, are represented at both herbaria, though mainly at the Academy. But Ethel Brubaker for Lancaster, F. Raymond Fosberg for Chester, and Mildred T. Travis for Delaware counties, have contributed only to the University's herbarium.

Lichens of the New York Area", a phrase presumably used as in Taylor's "Flora" to cover a radius of 100 miles from that city.) Louis E. Hand, in 1939 and 1940 Secretary of the Philadelphia Botanical Club, is a keen collector who spends much time afield. But this enumeration must end, though not without the realization that, to-day as in the past, there is ample promise for the future in the growing interest of so many younger men and women.

In scanning the record of such prolonged activity in the collecting and study of the flora of our Local Territory, one wonders whether we are near the conclusion of this effort to identify and classify its component plants and to portray their distribution, or whether we are still relatively near the beginning. For flowering plants and ferns surely the record in the Club's Herbarium, complemented by that at the University of Pennsylvania, is approaching a theoretical completion, although when that is reached there will remain the task of explaining each plant's occurrence in relation to its physical background of soil and climate, and against its further background of the geologic past. For mosses, fungi, lichens, and algae we still need collections as full as those now at hand for the higher plants. And beyond our inventory of life, our efforts to understand relationships and to map distributions, there remain many other things we need to learn about our plants—what are their life-histories, seasons, methods of survival over winter, of pollination, of dispersal by seeds or spores, etc. There remains for generations to come fascinating work for the membership of the Philadelphia Botanical Club.

At such a center as the Academy the appetite for specimens seems insatiable, but let us remember that the accumulating of specimens must ultimately find its justification in the information to be gleaned from these mummified records of a vegetative past—more than specimens we need an increasing succession of men and women who will gather this information and use it toward the better taxonomic work of the future. They will of course add specimens of their own, but, however that be, I think that the botanists of fifty years hence, gathered then to celebrate a century of our Club's history, will look back with gratitude to those who brought together such a magnificent representation of the flora of a tiny section of the Earth's surface as is contained in the Academy's Local Herbarium, sponsored by this Club. Through the vicissitudes of time it may well be that the printed record about them will outlast the specimens themselves, but these need to be preserved as long as possible—old Rafinesque was right when he spoke of herbarium specimens as "autikons", 'self-pictures', for they themselves have unimpeachable accuracy as against our efforts to tell of them in words.

The Cladoniae of Pennsylvania

W. L. Dix

The reader, if there should be one, should know from the beginning that this is not a treatise on *Cladonia*, and that the writer has not attempted, except as noted, to revise the determinations of the specimens he has examined. The purpose of this catalog is to make a check-list of the *Cladoniae* of Pennsylvania and to indicate the distribution of the different species within the state.

The *Cladoniae* of the United States, as a whole, have had no separate treatment by any student of lichens. Whatever has been written has been a part of the general subject of lichenology.

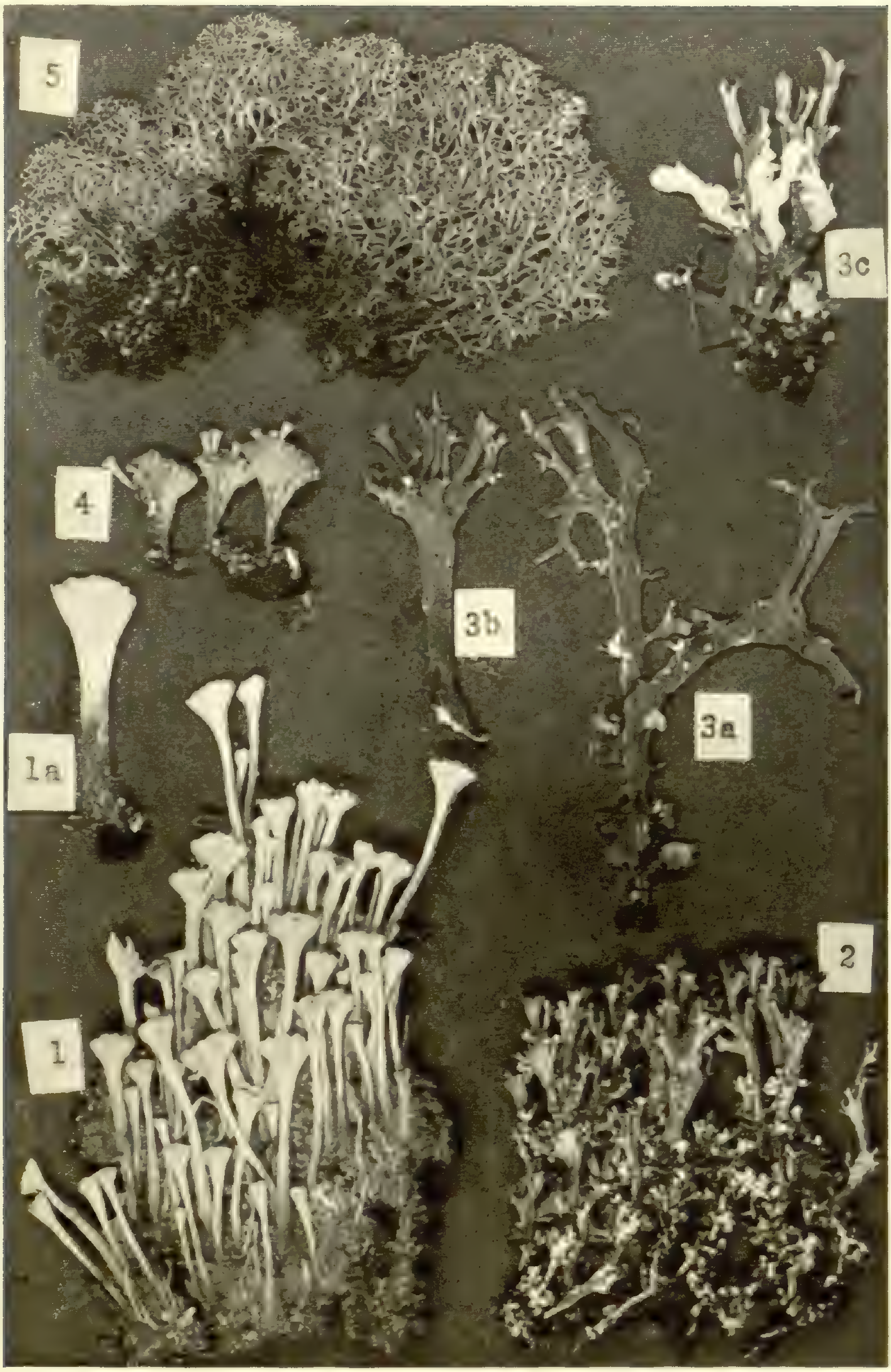
The earliest serious student of lichens in America was Edward Tuckerman. During the last half of the last century he published at least two books on this subject. In 1897 A. Schneider published a " Text-book of General Lichenology ". The most recent book is that of Bruce Fink who published in 1935 "The Lichen Flora of the United States". "Lichens", by Annie Lorain Smith, in the Cambridge University Series, and "Mosses and Lichens", by Nina Marshall, in the Doubleday Nature Series, are two readable books on the subject.

At this time there is in process of publication a modern book on lichens by G. G. Nearing. It is an untechnical treatment of the whole field " for students, beginners, and non-specializing botanists ".

However, there are available for those who can read a foreign language two works on *Cladonia* alone, — Vainio's " Monograph on the Cladoniae of the World ", and Sandstede's on " The Genus Cladonia ", dealing with the species found in Europe.

Fortunately, within the last decade there have been published four separate articles dealing with American *Cladoniae* of the eastern United States within limited areas. The first and most comprehensive of these is " The Cladoniae of Connecticut " by Dr. Alexander W. Evans of Yale University, published in 1930. To this he has added three supplements printed in Rhodora. In addition to these he published in Torreya in 1935 " The Cladoniae of New Jersey ", with supplements in 1938 and 1940. These include a short treatise on the morphology of the genus, descriptive and critical notes, the date and place of collection, and the name of the collector.

Two other articles are " The Cladoniae of the District of Columbia and Vicinity ", by Robbins and Blake, published in Rhodora in 1931, and " Cladoniae in the range of the Torrey Botanical Club " by Raymond Torrey in Torreya in 1933. Both of these contain photographic illustrations of most of the species described. Also, " The lichen Genus Cladonia in Wisconsin " by John W. Thomson, Jr., was published in the American Midland Naturalist in May, 1942.



SOME PENNSYLVANIA CLADONIAS

FIG. 1. *Cladonia major,* No. 44. FIG. 1a. *C. major,* single large podetia. FIG. 2. *C. degenerans* f. *phyllophora,* No. 37. FIG. 3a. *C. turgida* f. *corniculata,* No. 28a. FIG. 3b. *C. turgida* f. *scyphifera,* with proliferations and secondary cups, No. 28b. FIG. 3c. *C. turgida* f. *squamulosa,* No. 28c. FIG. 4. *C. pleurota* f. *centralis,* No. 12a. FIG. 5. *C. alpestris,* No. 5. All figures × 1.

The Bryologist, the official organ of the Sullivant Moss Society, has frequently published interesting articles on American *Cladoniae,* sometimes with good illustrations.

At least three lists of Pennsylvania *Cladoniae* have been published. The earliest of these is that of Muhlenberg, published as part of his "Catalogus Plantarum" in 1813. It mentions 18 species without locality, merely noting that practically all of the cryptogamous plants were collected in Pennsylvania.

The next list is that of Michener, published in William Darlington's "Flora Cestrica" in 1853. It lists 12 species and 10 varieties, but mentions no localities within the county. Six of the twelve specimens of this collection, now at the State Teachers College at West Chester, cite New Garden as the locality. Michener's home was in that township.

The third list, included in a report on the lichens of western Pennsylvania, is by Giovanni I. Giardini, published in the Bryologist of September, 1922. This account lists 22 species, practically all of which are represented by specimens in the Carnegie Museum in Pittsburgh, Pa. Most of the identifications were made by G. K. Merrill.

The Herbarium of the Carnegie Museum contains some 120 specimens of Pennsylvania *Cladoniae,* largely the collection of Dr. O. E. Jennings. Eighteen species are represented.

In recent years, in addition to the collections of the author, extensive collections have been made by Dr. John W. Thomson, Jr. in the central counties, by Raymond Torrey and G. G. Nearing in the eastern counties, and by Dr. Evans in Pike and Monroe counties.

Many recent changes in interpretation have resulted in the division of some species and the raising of varieties to the rank of species. This will explain in part some differences of nomenclature between the species of the old collections and those of recent date. Also some of the recently segregated species have been separated largely on the basis of chemical differences. While any one has a right to his opinion about the validity of species so separated, the great service of chemistry in determining some of the closely related species must be recognized.

Throughout the catalog specimens collected by the writer will be listed by the date of collection only. Other collections will bear the name of the collector. The listing of specimens under the species alone does not indicate that they are typical of it, but rather that they possess no special distinctness of form.

All the specimens collected by the author, by Dr. Thomson, Mr. Nearing, and Mr. Torrey have been examined by Dr. Evans, and are in the herbarium of the Osborn Botanical Laboratory of Yale University. The location of other specimens is indicated in the text as follows: AS., Academy of Natural Sciences of Philadelphia; C., Carnegie Museum in Pittsburgh, Pa.; D., Darlington's Collection at State Teachers' College, West Chester, Pa.; NY., New York Botanical

Garden, New York City; SI., United States National Museum, Smithsonian Institution, Washington, D. C.; and SMS., Sullivant Moss Society, Missouri Botanical Garden, St. Louis, Mo. To the curators of these herbaria I am indebted.

On the title page of this catalog should appear the name of Dr. Alexander W. Evans. In addition to examining and making written reports on most of the one thousand specimens listed here, he has given detailed explanations on new or difficult species, directed the writer to sources of information, and exhumed many an old outmoded synonymy. To all this and many other services must be added his constant advice and encouragement. Whatever is of value in this catalog should be credited to him.

The writer is also grateful for the assistance of Dr. O. E. Jennings, Curator of Botany at the Carnegie Museum, Dr. John M. Fogg, Jr., Dean of Arts and Sciences at the University of Pennsylvania, Dr. Robert B. Gordon, of West Chester State Teachers College, Mr. G. G. Nearing of Ridgewood, N. J., and Dr. John W. Thomson, Jr., of State Teachers College, Superior, Wisconsin.

EARLY COLLECTIONS OF CLADONIAE IN PENNSYLVANIA

(not listed in the Catalog)

The following series is from Muhlenberg's "Catalogus Plantarum Americae Septentrionalis", published in Lancaster in 1813, and follows his order. In parentheses are the names of the probable species represented, according to more recent nomenclature.

Cenomyce alcicornis
" parecha (cf. C. turgida)
" pyxidata
" coccifera
" deformis
" bacillaris
" allotropa (cf. C. furcata)
" adunca
" furcata

Cenomyce rangiferina
" acicularis (cf. C. fimbriata)
" cariosa
" cornuta
" gonorega (cf. C. degenerans)
" symphicarpa
" delicata
" capitata (cf. C. mitrula)

HABITAT NOTES

Notes on the habitat of the different species and forms have been omitted from the text because they usually are a tiresome repetition. Lichens grow where they are found. However soil preferences and geological limitations do affect the distribution of all lichens.

Practically all species of Cladonia will grow on bare, or barren, ground. On rocks will be found *C. cristatella*, *C. pyxidata*, *C. chlorophaea*, *C. Grayi*, *C. conista* and *C. coniocraea*. Among mosses and other vegetation will be found particularly the Cladinae, *C. furcata*, *C. scabriuscula*, *C. multiformis*, *C. squamosa*, *C. turgida*, *C. gracilis*, *C. verticillata*, *C. chlorophaea*, *C. Grayi*, and *C. nemoxyna*. Those likely to be found on tree bases include *C. didyma*, *C. cristatella*, *C. mitrula*, *C. chlorophaea*, *C. Grayi*, *C. fimbriata*, *C. coniocraea*, and

C. pityrea. On dead or decaying wood all species grow except the Cladinae, seldom, *C. papillaria*, *C. caroliniana*, *C. uncialis*, *C. furcata*, *C. scabriuscula*, *C. apodocarpa*, *C. turgida*, *C. clavulifera*, *C. subcariosa*, *C. gracilis*, *C. verticillata*, *C. major*, *C. fimbriata*, *C. nemoxyna*, and *C. strepsilis*.

KEY to the SPECIES of Pennsylvania CLADONIAE.

A key is not a series of fool-proof compartments into which one can toss species with the same degree of definiteness as that with which a printer sorts pi. A Key for the Cladoniae is especially difficult, for often species differ within themselves more than they differ from each other. For that reason the novice will with difficulty recognize *C. subcariosa* f. *evoluta* and *C. subcariosa* f. *pleurocarpa* as of the same species, while the separation of *C. verticillata* and *C. calycantha* is based on very small differences. For these reasons this Key is somewhat like a country signpost which points along the right path, but presupposes a more or less intimate knowledge of the habits of country roads.

Glossary for Key.

Primary thallus — Fundamental basal plant structure.
Squamules — Leaf-like structures.
Podetia — Stem-like growths.
Cortex — Rind covering the podetia.
Apothecia — Fruiting bodies.
Soredia — Fine powdery masses or grains.
K — Abbreviation for KOH.
P — Abbreviation for paraphenylenediamine.

The minus sign, or an indicated color, after P or K indicates either the lack of reaction, or the color following the use of these chemicals.

- A. Podetia with cups.
  - B. Sorediose.
    - C. Apothecia red.
      - D. P–.
        - E. Soredia granular; cups usually regular .... 12. *C. pleurota*
        - EE. Soredia farinose; cups usually irregular. 13. *C. deformis*
      - DD. P red; cups ill-shaped, edges turned inward. 14. *C. digitata*
    - CC. Apothecia brownish.
      - D. Cups definite and well-developed.
        - E. Soredia granular.
          - F. P red .... 40. *C. chlorophaea*
          - FF. P– .... 41. *C. grayi*
        - EE. Soredia farinose.
          - F. Podetia 25 mm. high or over..................... 44. *C. major*
          - FF. Podetia less than 25 mm. high.
            - G. Cups usually 2-5 mm. wide at top of slender podetia. 43. *C. fimbriata*
            - GG. Cups usually 5-10 mm. wide at top of stout podetia. 42. *C. conista*
      - DD. Cups irregular, obsolete, or wanting.
        - E. Soredia granular.
          - F. Cups funnel-shaped, tops turned inward. .... 24. *C. cenotea*
          - FF. Cups shallow, often flaring.
            - G. Squamules usually replacing soredia, except in f. *epiphylla*, which is corticate................ 49. *C. pityrea*
            - GG. Podetia esquamulose. .... 45. *C. nemoxyna*

EE. Soredia farinose.

F. Podetia also bearing coarse granules; primary squamules small. 48. *C. borbonica*

FF. Podetia not bearing coarse granules; primary squamules large.

G. Cups corticate within....................46. *C. ochrochlora*

GG. Cups ecorticate within....................47. *C. coniocraea*

BB. Esorediose.

C. Apothecia red ....11. *C. coccifera*

CC. Apothecia brownish.

D. Cups open, small, funnel-like at tips of podetia..........23. *C. squamosa*

DD. Cups normally closed, broad, but with sieve-like perforations or slits. 21. *C. multiformis*

DDD. Cups closed, but not perforated.

E. Cups shallow, usually in tiers, and proliferate.

F. Cups usually regular.

G. Proliferations primarily from center of cup.

H. Cups gradually expanded from podetia. 35. *C. verticillata*

HH. Cups abruptly expanded from podetia. 36. *C. calycantha*

GG. Proliferations primarily from margins of cups. 34. *C. gracilis*

FF. Cups usually irregular; proliferations generally from margins of cups, primarily.

G. Cortex fragmentary, often exposing a net-like pattern on the medulla ....37. *C. degenerans*

GG. Cortex continuous ....38. *C. mateocyatha*

EE. Cups deep (goblet-formed); very rarely proliferous...39. *C. pyxidata*

AA. Podetia without cups.

B. Sorediose.

C. Apothecia red.

D. Plants P–red and K–yellow ....9. *C. macilenta*

DD. Plants P– and K–.

E. Podetia more or less corticate entire length.

F. Podetia usually obconic; soredia on squamules. 16. *C. incrassata*

FF. Podetia usually cylindric, occasionally subulate. 7. *C. floerkeana*

EE. Podetia largely ecorticate.

F. Podetia covered with small squamules or granular soredia. 10. *C. didyma*

FF. Podetial soredia farinose.......................8. *C. bacillaris*

CC. Apothecia brownish.

D. K–orange; podetia simple or sparingly branched; on earth. 33. *C. acuminata*

DD. K–yellow; podetia seldom branched; on stumps or rotting logs. 25. *C. delicata*

DDD. K–; seldom branched, except in *C. scabriuscula*.

E. Podetia 3-6 cm. long, usually branched; often corticate over half their length ....20. *C. scabriuscula*

EE. Podetia less than 3 cm. long, seldom branched, corticate less than half their length from base.

F. Soredia granular.

G. Podetia more or less squamulose (except in *f. epiphylla,* also esorediose).............49. *C. pityrea*

GG. Podetia without squamules. ....45. *C. nemoxyna*
FF. Soredia farinose.
G. Podetial area more or less corticate. 46. *C. ochrochlora*
GG. Podetia corticate only basally............47. *C. coniocraea*
BB. Esorediose.
C. Podetia growing from a persistent crustaceous base. ....6. *C. papillaria*
CC. Podetia without persistent crustaceous base.
D. Apothecia red. ....15. *C. cristatella*
DD. Apothecia brownish.
E. Podetia growing in mat-like colonies, not persistent basally, intricately interwoven, sometimes long, slender, and many-branched.
F. Podetia lacking a real cortex; small terminal branches often parallel.
G. Podetia dead gray, with no stramineous color. 1. *C. rangiferina*
GG. Podetia greenish gray, with stramineous tinge.
H. Ultimate branchlets usually "swept" in one direction; branches often whorled; axils open.
I. P red. ....2. *C. silvatica*
II. P–. ....3. *C. mitis*
H. Ultimate branchlets pointing in several directions; branches not so often whorled; axils closed. 4. *C. tenuis*
GGG. Podetia whitish or grayish, with little stramineous color. 5. *C. alpestris*
FF. Podetia corticate; terminal branches divergent.
G. Podetia with more or less stramineous color; tips of sterile branchlets spiny-pointed; P–.
H. Axillary perforations usually lacking on sterile podetia; inner podetial surface rough...18. *C. caroliniana*
HH. Axillary perforations usually present; inner podetial surface smooth. ....17. *C. uncialis*
GG. Podetia with no stramineous color, grayish, olivaceous, or brownish.
H. P red.
I. Squamules 1-2 cm. long. (Undeveloped plants persistent basally.) ....28. *C. turgida*
II. Squamules less than 1 cm. long...19. *C. furcata*
HH. P– or P yellow. ....23. *C. squamosa*
EE. Podetia not in mat-like colonies; persistent basally, not interwoven; shrub-like, or in *C. strepsilis* rather irregular and shapeless.
F. Podetia with tubular-shaped openings in tips and crotches; K yellow and P red. ....22. *C. floridana*
FF. Podetia without tubular openings in tips and crotches.
G. P red.
H. Podetia none; apothecia sessile on squamules, or wanting. ....27. *C. apodocarpa*
HH. Podetia developed.
I. Podetia about 2-3 mm. long. ..26. *C. caespiticia*
II. Podetia normally more than 5 mm. long.
J. Apothecia pale brown, usually twice the width of podetia. ....29. *C. mitrula*
JJ. Apothecia dark brown, scarcely wider than apothecia.

K. K red. ....31. *C. subcariosa*
KK. K yellow. ....32. *C. cariosa*
KKK. K–. ....30. *C. clavulifera*
GG. P–; primary squamules stramineous beneath.
H. Apothecia dark brown or purplish; CaCl (K) bluish green. ....50. *C. strepsilis*
HH. Apothecia light brown or lavender; CaCl (K)–. 51. *C. piedmontensis*

Subgenus 1. Cladina (Nyl.) Vainio

1. Cladonia rangiferina (L.) Web.

Lichen rangiferinus of Linnaeus, the earliest name of the species, originally comprised at least six species as now separated by most taxonomists,—*Cladonia rangiferina, C. silvatica, C. mitis, C. tenuis, C. impexa,* and *C. alpestris.*

PENNSYLVANIA: No locality cited. (*Tuckerman*, Exs. No. 127.) Also listed in his N. A. Lichens, p. 248. BEDFORD: Bedford Springs (*Jennings*, 1919, C.). BRADFORD: Armenia Mt. and Cedar Ledge (*Nearing*, 1939). CHESTER: No locality cited (*Jacob Porter*, without date, D.). ERIE: Presque Isle (*Jennings*, 1906, C., and Cedar Point, 1905, C.). FULTON: Burnt Cabins (*John Link*, 1925, C.). HUNTINGDON: Nature Camp and Penn. State Research Forest (*Thomson*, 1937). LANCASTER: Welsh Mt. (*J. K. Small*, 1925, SI.), Conewago (*A. A. Heller*, 1892, SI.). LEHIGH: Blue Mt. (*Torrey*, 1933). MONROE: Water Gap (1941), Poconos and Water Gap (*Evans*, 1941). PIKE: Bushkill Falls (*Nearing*, 1941) and near Newfoundland (*Evans*, 1941). SULLIVAN: Bernice and Forksville (*Nearing*, 1939). SUSQUEHANNA: Starrucca Depot (1941). WAYNE: Shehawken (1939) and Galilee (*Nearing*, 1939). WYOMING: Nicholson (1941).

1a. Cladonia rangiferina f. incrassata Schaer.

This is more robust than the normal forms of this species, and has wrinkled podetial surfaces.

BRADFORD: Cedar Ledge (*Nearing*, 1939).

1b. Cladonia rangiferina f. leucitica Flet.

This is a shade form, and is marked by fewer branches and a lighter color.

MONROE: Poconos (*Evans*, 1941).

2. Cladonia silvatica (L.) Hoffm.

PENNSYLVANIA: No locality cited (*Tuckerman*, Exs. No. 128). BERKS: Birdsboro (1939). BUCKS: Haycock Mt. (*Geo. B. Kaiser*, 1910, P., and SMS. det. Mary Miller). [CHESTER: The specimen so named in D. proves to be *C. furcata.*] HUNTINGDON: Nature Camp and Penn. State Research Forest (*Thomson*, 1937). LANCASTER: Wakefield (*Nearing*, 1940). MONROE: Poconos (*Evans*, 1941). MONTGOMERY: Haverford (*J. W. Eckfelt*, 1876, AS.). PIKE: Bushkill Falls (1941), near Newfoundland (*Evans*, 1941). SULLIVAN: Bernice (*Nearing*, 1939). WAYNE: Shehawken (1939).

2a. Cladonia silvatica f. laxiuscula Del.

This form is marked by its loosely intertwined podetia. Some of the specimens formerly classified as above would be now listed as *C. impexa.*

ALLEGHENY: near Carnot (*J. A. Shafer*, 1888, C., det. Merrill). FAYETTE: Ohiopyle (*O. E. Jennings*, 1908, C., det. Merrill).

3. Cladonia mitis Sandst.

This species is so similar to *C. silvatica* that it is most easily determined by its negative reaction to P. Certainly more common than this single collection would indicate.

WAYNE: Shehawken (1940).

4. Cladonia tenuis (Floerke) Harm.

BERKS: Birdsboro (1939). BRADFORD: Cedar Ledge (*Nearing*, 1939). BUCKS: Newtown and Morrisville (1939). CHESTER: Nottingham (*Nearing*, 1940). COLUMBIA: Buck Glen (1941). DAUPHIN: Deodate (1941). HUNTINGDON: Nature Camp (*Thomson*, 1937). LACKAWANNA: Moscow (*Nearing*, 1939). LANCASTER: Wakefield (*Nearing*, 1940). LYCOMING: Hepburnville (1941). MONROE: Marshall's Creek (*Torrey*, 1937) and Poconos (*Evans*, 1941). PERRY: Sterrett's Gap (1941). PIKE: Bushkill Falls (*Nearing*, 1941) and near Newfoundland (*Evans*, 1941). SULLIVAN: Forksville (*Nearing*, 1939). SUSQUEHANNA: Starrucca Depot (1941). UNION: Foresthill (1941). WAYNE: Shehawken (1939), and Galilee (*Nearing*, 1939). WYOMING: Nicholson (1941).

4a. Cladonia tenuis f. setigera Sandst.

This form is marked by hair-like appendages growing from the tips of branchlets or sides of the podetia.

PIKE: Bushkill Falls (*Thomson*, 1940).

5. Cladonia alpestris (L.) Rabenh.

CHESTER: No locality cited (probably *Michener*, D.). This specimen is labelled "*Cenomyce rangiferina* (Ach.) Var." Also listed in Flora Cestrica as *C. rangiferina* var. *alpestris*. These two records may belong to the same specimen. WAYNE: Shehawken (1939). This recent collection [1] is according to Dr. Evans, "the first I've seen from an intermediate locality" between New York State and "a single station in West Virginia". It was found in an unused pasture on the north side of a hill at an elevation of about 2100 feet. Only a single "biscuit" was found, and no amount of search in the vicinity or in that part of Wayne County has revealed more. Southern forms of this species, or what was considered this species, have been segregated as *C. Evansii* des Abbeyes.

Subgenus 2. Pycnothelia

6. Cladonia papillaria (Ehrh.) Hoffm.

CHESTER: Nottingham (*Rodney True*, 1935, P.). MONTGOMERY: Haverford (*J. W. Eckfelt*, 1882, AS.). PIKE: Bushkill Falls (1941).

6a. Cladonia papillaria f. molariformis (Hoffm.) Schaer.

In this form the podetia are simple, or sparingly branched.

BERKS: Birdsboro (1940). BRADFORD: Armenia Mt. (*Nearing*, 1939). BUCKS: Newtown (1939). CHESTER: Nottingham (*Nearing*, 1940). HUNTINGDON: Nature Camp (*Thomson*, 1939). LANCASTER: Wakefield (*Nearing*, 1940). LEBANON: Mt. Gretna (1941). LUZERNE: Penobscot Head (*Torrey*, no date). MONROE: Poconos (*Evans*, 1941). PIKE: Bushkill Falls (1941). WAYNE: Shehawken (1939).

6b. Cladonia papillaria f. papillosa Fr.

The podetia of f. *papillosa* are very rudimentary, and papilliform.

CHESTER: Nottingham (*Nearing*, 1940). HUNTINGDON: Nature Camp (*Thomson*, 1937). LUZERNE: Penobscot Head (*Torrey*, no date). MONROE: Poconos (*Evans*, 1941).

---

[1] See Torreya 40: 45. 1940.

6c. Cladonia papillaria f. stipata Floerke

The upper part of the podetia in this form is densely branched.

HUNTINGDON: Nature Camp (*Thomson*, 1937). LANCASTER: Wakefield (*Nearing*, 1940). MONROE: Water Gap and Poconos (*Evans*, 1941).

Subgenus 3. Cenomyce

Section 1. Cocciferae

Subsection 1. Subglaucescentes

7. Cladonia Floerkeana (Fr.) Floerke

CHESTER: Listed in Flora Cestrica. [However, the specimen labelled "Cladonia Floerkii Fr. Ex. Herb. E. Michener" in D. is, according to Dr. Evans, *C. cristatella* f. *Beauvoisii*.] LYCOMING: Ellenton (*Nearing*, 1939).

7a. Cladonia Floerkeana f. intermedia Hepp

The podetia have no squamules, except occasionally toward the base.

PIKE: Bushkill Falls (*Nearing*, 1941), and near Newfoundland (*Evans*, 1941). WAYNE: Scott Center (1941).

7b. Cladonia Floerkeana var. carcata (Ach.) Vainio

This variety has the podetia covered throughout with scattered squamules.

WAYNE: Shehawken (1940).

8. Cladonia bacillaris (Ach.) Nyl.

BERKS: Birdsboro (1940). BRADFORD: Cedar Ledge and Armenia Mt. (*Nearing*, 1939). CENTER: Bear Meadows (*Thomson*, 1937). CHESTER: Nottingham (*Nearing*, 1940). HUNTINGDON: Nature Camp (*Thomson*, 1937). LANCASTER: Wrightsdale (*Nearing*, 1940). LEHIGH: Blue Mt. (*Torrey*, 1933). LYCOMING: Ellenton (*Nearing*, 1939). MONROE: Water Gap and Poconos (*Evans*, 1941). NORTHUMBERLAND: Turbotville (1941). PIKE: Bushkill Falls (1940), and near Newfoundland (*Evans*, 1941), Pa. Route #402 (1941). SULLIVAN: Bernice (*Nearing*, 1939). SUSQUEHANNA: Starrucca Depot (1941). TIOGA: Liberty (*Torrey*, 1937), Harrison State Park (*Nearing*, 1939). WAYNE: Shehawken (1940), Galilee (*Nearing*, 1939). YORK: Bryansville (*Nearing*, 1940).

8a. Cladonia bacillaris f. peritheta (Wallr.) Arn.

The accessory apothecia in f. *peritheta* are either sessile, or on short terminal branches.

HUNTINGDON: Nature Camp (*Thomson*, 1937)

8b. Cladonia bacillaris f. clavata (Ach.) Vainio

This form has blunt podetia.

HUNTINGDON: Nature Camp (*Thomson*, 1937). FAYETTE: Ohiopyle (*Jennings*, Giardini's Report in Bryologist, Sept. 1922).

9. Cladonia macilenta Hoffm.

Cladonia macilenta can always be separated from the other species of this group by its positive reaction to K(yellow) and P(red).

BERKS: Monterey (*Mrs. E. C. White*, 1921, SI., det. Evans). CENTER: Bear Meadows (*Thomson*, 1937). CHESTER: Listed in Flora Cestrica. LAWRENCE: Slippery Rock (*Susan Gageby*, 1906, C.).

9a. Cladonia macilenta f. styracella (Ach.) Vainio

The podetia in this form are covered with farinose soredia.

BRADFORD: Cedar Ledge and Armenia Mt. (*Nearing*, 1939). CENTER: Bear Meadows (*Thomson*, 1937). HUNTINGDON: Nature Camp (*Thomson*, 1937). LANCASTER: Wakefield (*Nearing*, 1940). MONROE: Pocono Mts. (*Torrey*, no date), Poconos (*Evans*, 1941). MONTOUR: Washingtonville (1941). SNYDER: Beaver Springs (1941). SULLIVAN: Bernice (*Nearing*, 1939). SUSQUEHANNA: Starrucca Depot (1940). WAYNE: Shehawken (1940), and Galilee (*Nearing*, 1939). UNION: Foresthill (1941). YORK: Bryansville (*Nearing*, 1940).

9b. Cladonia macilenta f. granulosa Aigret

This differs from the previous form in having coarser soredia.

PIKE: Bushkill Falls (1940).

9c. Cladonia macilenta f. squamigera Vainio

C. macilenta f. *squamigera* is marked by its squamulose podetia.

WAYNE: Shehawken (1941).

9d. Cladonia macilenta f. tomentosula (Floerke) Aigret

Differs from f. *styracella* in being more robust and more densely sorediose.

WAYNE: Scott Center (1941).

10. Cladonia didyma (Fée) Vainio

FAYETTE: Ohiopyle (*Jennings*, 1905, 1907, C.; also as "*Cladonia pulchella*", det. G. K. Merrill, who notes, "species belongs, as a variety, to *C. didyma*".) From Giardini's Report. HUNTINGDON: Nature Camp (*Thomson*, 1937). PIKE: Bushkill Falls (1941).

10a. Cladonia didyma f. subulata Sandst.

This form has pointed, translucent, and ecorticate podetia.

CHESTER: Nottingham (*Nearing*, 1940). HUNTINGDON: Nature Camp (*Thomson*, 1937). PIKE: Bushkill Falls (1941).

Subsection 2. Stramineo-flavidae

11. Cladonia coccifera (L.) Wild.

[CHESTER: The specimen in D. labelled "*Cenomyce coccifera* (Ach.)" proves to be *Cladonia cristatella* f. *Beauvoisii*.] ARMSTRONG: Kittaning (*D. R. Sumstine*, 1902). This specimen is listed in Giardini's Report in the Bryologist, Sept., 1922, with this comment, "this is a rather doubtful specimen". Probably determined by G. K. Merrill.

12. Cladonia pleurota (Floerke) Schaer.

BERKS: Birdsboro (1940). BRADFORD: Cedar Ledge and Armenia Mt. (*Nearing*, 1939). BUCKS: Washington's Crossing (1940). CHESTER: Nottingham (*Nearing*, 1940). LANCASTER: Wrightsdale (*Nearing*, 1940). LEBANON: Mt. Gretna (1941). MONROE: Water Gap and Poconos (*Evans*, 1941). NORTHUMBERLAND: Turbotville (1941). PHILADELPHIA: near Bustleton (1941). PIKE: Lake Wallenpaupack (*Torrey*, 1937), near Newfoundland (*Evans*, 1941). SULLIVAN: Forksville (*Nearing*, 1939). SUSQUEHANNA: Starrucca Depot (1941). TIOGA: Harrison State Park (*Nearing*, 1939). UNION: Foresthill (1941). WAYNE: Shehawken (1940), and White Mills (*Torrey*, 1937). YORK: Bryansville and Delta (*Nearing*, 1940).

12a. Cladonia pleurota f. centralis (Schaer.) Oliv.

This form has central proliferations. I believe this is the only record of f. *centralis* in America. Dr. Evans writes, " Sandstede mentions an *f. centralis* Schaer. under var. *frondescens,* and Anders also mentions an *f. centralis* Schaer. under *C. pleurota* itself . . . but so far as I can learn Schaerer did not propose the combination attributed to him."

WAYNE: Shehawken (1940).

13. Cladonia deformis (L.) Hoffm.

WAYNE: Lakewood (1941), and Scott Center (1941).

13a. Cladonia deformis f. crenulata (Ach.) Sandst.

Margins of the taller cups are somewhat crenulate, and the soredia are farinose.

HUNTINGDON: Nature Camp (*Thomson,* 1937).

14. Cladonia digitata (L.) Hoffm.

MONROE: Pocono Mts. (*Torrey,* no date). PIKE: Bushkill Falls (*Nearing,* 1940, and *Thomson,* 1940). WAYNE: Shehawken (1939).

14a. Cladonia digitata f. monstrosa (Ach.) Vainio

A form with larger, more regular cups.

WAYNE: Scott Center (1941).

15. Cladonia cristatella Tuck.

ALLEGHENY: Thornhill (*Jennings,* 1908, C., det. Merrill), near Carnot (*J. A. Shafer,* 1888, C., det. Merrill), between Wildwood and Gibsonia (*Jennings,* 1905, C.), Wildwood Road (*Jennings,* 1908, C., det. Merrill), Schenley Park (*Jennings* and *Kinzer,* 1905, C., det., Merrill).

The following key will separate the many forms of *C. cristatella:*

- Plants with scarlet apothecia.
  - Apothecia on distinct podetia.
    - Podetia without squamules.
      - Podetia cupless. f. *Beauvoisii*
      - Upper branches forming a cup-like depression. f. *scyphulifera*
    - Podetia with squamules.
      - Apothecia at ends of podetia, or main branches.
        - Squamules of medium size. f. *vestita*
        - Squamules small, densely crowded. f. *squamosissima*
      - Apothecia sessile, or short-stalked from sides of podetia. f. *pleurocarpa*
  - Apothecia sessile on squamules, or on short stalks. f. *abbreviata*
- Plants with orange, yellowish, or flesh-colored apothecia.
  - Podetia without squamules.
    - Apothecia flesh-colored to yellowish. f. *ochrocarbia*
    - Apothecia orange. f. *aurantiaca*
  - Podetia squamulose. f. *squamulosa*

15a. Cladonia cristatella f. Beauvoisii (Del.) Vainio

BERKS: Birdsboro (1940). BRADFORD: Cedar Ledge and Armenia Mt. (*Nearing,* 1939). BUCKS: Morrisville (1939). CHESTER: No locality cited (Specimen labelled, "Coccifera Ach. Ex. Herbarium Wm. Darlington" and specimen labelled, "Cladonia Floerkii Fr. Ex Herbarium E. Michener", D.), and Nottingham (*Nearing*, 1940). DAUPHIN: Deodate (1941). DELAWARE: No locality cited (*J. W. Eckfeldt*, 1878). HUNTINGDON: Penn. State Research Forest (*Thomson*, 1937). LANCASTER: Wakefield and Wrightsdale (*Nearing*, 1940). LEBANON: Mt. Gretna (1941). LUZERNE: Ellenton (*Nearing*, 1939), and Hepburnville (1941). MIFFLIN: Maitland (1941). MONROE: Blakeslee (*Torrey*, 1936), Scotrun (*Nearing*, 1939), and Poconos and Water Gap (*Evans*, 1941). MONTOUR: Washingtonville (1941). NORTHUMBERLAND: Turbotville (1941). PERRY: Sterrett's Gap (1941). PIKE: Shohola Falls (*Torrey*, 1937), Bushkill Falls (1941, and *Evans*, 1941). SULLIVAN: Eagles Mere (*Torrey*, 1937), Forksville and Bernice (*Nearing*, 1939). SUSQUEHANNA: Starrucca Depot (1941). TIOGA: Harrison State Park (*Nearing*, 1939). WAYNE: Shehawken (1939), and Galilee (*Nearing*, 1939). YORK: Bryansville and Delta (*Nearing*, 1940).

15b. Cladonia cristatella f. vestita Tuck.

ALLEGHENY: Wildwood Station (*Wm. Milward*, 1919, C.), Fern Hollow, Pittsburg (*Giardini*, 1921, C.). ARMSTRONG: Kittaning (*Amy Neale*, 1926, C.). BRADFORD: Cedar Ledge and Armenia Mt. (*Nearing*, 1939). BUCKS: Morrisville (1939). BUTLER: Nixon Station (*Milward*, 1917). CHESTER: Nottingham (*Nearing*, 1940). DAUPHIN: Deodate (1941). HUNTINGDON: Nature Camp (*Thomson*, 1937). LACKAWANNA: Moscow (*Nearing*, 1939). LEBANON: Mt. Gretna (1941). LUZERNE: Ellenton (*Nearing*, 1939), and Hepburnville (1941). MIFFLIN: Maitland (1941). MONROE: Scotrun (*Nearing*, 1939), and Poconos and Water Gap (*Evans*, 1941). MONTOUR: Washingtonville (1941). NORTHUMBERLAND: Turbotville (1941). PERRY: Sterrett's Gap (1941). PIKE: Bushkill Falls (*Thomson*, 1940, and *Evans*, 1941). SULLIVAN: Eagles Mere (*Torrey*, 1937), and Bernice (*Nearing*, 1939). SUSQUEHANNA: Starrucca Depot (1940). TIOGA: Harrison State Park (*Nearing*, 1939). WASHINGTON: Van Emman (*Jennings*, 1922, C.). WAYNE: Lake Shehawken (1939), and Galilee (*Nearing*, 1939). WESTMORELAND: Laurel Mt. New Florence (*Jennings*, 1907, in Giardini's Report in Bryologist, Sept., 1922). YORK: Near York (1941), and Bryansville and Delta (*Nearing*, 1940).

15c. Cladonia cristatella f. squamosissima Robbins.

MONROE: Poconos (*Evans*, 1941). WAYNE: Shehawken (1940).

15d. Cladonia cristatella f. pleurocarpa Robbins

BUCKS: Morrisville (1940). LYCOMING: Ellenton (*Nearing* 1939). MONROE: Poconos (*Evans*, 1941). PIKE: Bushkill Falls (*Evans*, 1941). WAYNE: Shehawken (1940).

15e. Cladonia cristatella f. scyphulifera Sandst.

BRADFORD: Cedar Ledge and Armenia Mt. (*Nearing*, 1939). BUCKS: Morrisville (1939). LACKAWANNA: Moscow (*Nearing*, 1939). LUZERNE: Pike's Creek (*Nearing*, 1939). LYCOMING: Ellenton (*Nearing*, 1939). MONROE: Poconos ((*Evans*, 1941). SULLIVAN: Bernice (*Nearing*, 1939). SUSQUEHANNA: Starrucca Depot (1941). WAYNE: Shehawken (1941). YORK: Delta and Bryansville (*Nearing*, 1940).

15f. Cladonia cristatella f. abbreviata Merrill

HUNTERDON: Nature Camp (*Thomson*, 1937). LYCOMING: Ellenton (*Nearing*, 1939). TIOGA: Harrison State Park (*Nearing*, 1939).

15g. Cladonia cristatella f. ochrocarpia Tuck.

BRADFORD: Armenia Mt. (*Nearing*, 1939). PIKE: Bushkill Falls (*Thomson*, 1940). WAYNE: Shehawken (1941).

15h. Cladonia cristatella f. aurantiaca Robbins

WAYNE: Shehawken (1941).

15i. Cladonia cristatella f. squamulosa Robbins

BUCKS: Morrisville (1941). HUNTINGDON: Nature Camp (*Thomson*, 1937). MIFFLIN: Maitland (1941). WAYNE: Shehawken (1939).

16. Cladonia incrassata Floerke

BRADFORD: Armenia Mt. (*Nearing*, 1939). CENTER: Bear Meadows (*Thomson*, 1937). LACKAWANNA: Moscow (*Nearing*, 1939). PIKE: Bushkill Falls (1940 and *Thomson*, 1940). SUSQUEHANNA: Starrucca Depot (1940). WAYNE: Shehawken (1940).

16a. Cladonia incrassata f. **aurantiaca** f. nov.

Apotheciis aurantiacis. This form has orange-colored apothecia, and is esquamulose. It is analogous to *C. cristatella* f. *aurantiaca* Robbins.

WAYNE: Scott Township (1941).

16b. Cladonia incrassata f. epiphylla (Fr.) Vainio

Apothecia in this form are sessile on the primary squamules.

WAYNE: Scott Township (1941).

16c. Cladonia incrassata f. squamulosa (Robbins) Evans

The podetia in this form are more or less densely squamulose.

WAYNE: Scott Township (1941).

Subsection 2. Ochrophaeae

Subsection 1. Unciales

17. Cladonia uncialis (Del.) Vainio

PENNSYLVANIA: No locality cited (*Tuckerman* in Syn. Am. Lich., 1848. "S", probably *Schweinitz*, as the record seems to be in his handwriting. AS.). BRADFORD: Cedar Ledge (*Nearing*, 1939). HUNTINGDON: Nature Camp (*Thompson*, 1937). LANCASTER: McCall's Ferry (*A. A. Heller*, 1892). MONROE: Water Gap and Poconos (*Evans*, 1941). MONTGOMERY: Gladwyne (*Geo. B. Kaiser*, 1910, SMS.). PIKE: Bushkill Falls (1940). WAYNE: Shehawken (1939).

17a. Cladonia uncialis f. setigera Anders.

A form bearing fibrils on the ultimate branchlets.

LEHIGH: Blue Mt. (*Torrey*, 1933).

17b. Cladonia uncialis f. spinosa Oliv.

A form with prostrate podetia bearing short spiny outgrowths.

WAYNE: Galilee (*Nearing*, 1939).

17c. Cladonia uncialis f. turgescens (Del.) Fr.

F. *turgescens* is characterized by having large podetia and by being sparsely branched.

PIKE: Bushkill Falls (*Thomson*, 1940).

18a. Cladonia caroliniana f. dilatata Evans

In f. *dilatata* the podetia are more or less dilated upward, about 2-5 mm. wide.

BERKS: Birdsboro (1939). LANCASTER: Wakefield (*Nearing*, 1940). MONROE: Water Gap and Poconos (*Evans*, 1941).

18b. Cladonia caroliniana f. tenuiramea Evans

In this form the podetia are usually less than 1 mm. in diameter.

BERKS: Birdsboro (1939). LANCASTER: Wakefield (*Nearing*, 1940). MONROE: Poconos and Water Gap (*Evans*, 1941).

18c. Cladonia caroliniana f. prolifera Evans

The podetia in this form have adventive outgrowths.

MONROE: Poconos and Water Gap (*Evans*, 1941).

Subsection 2. Chasmariae

Group 1. Microphyllae

19. Cladonia furcata (Huds.) Schrad.

ARMSTRONG: No locality cited (In Giardini's Report in Bryologist, Sept., 1922). LANCASTER: Conewago (*John K. Small*, 1892, NY.). MONROE: Pocono Mt. (*Small*, 1888, NY.).

Key to the varieties and forms of *C. furcata.*

Podetia whitish to greenish gray.	
Cortex smooth and subcontinuous.	var. *racemosa*
Podetia esquamlose.	
Podetia fertile.	
Podetia only slightly fissured.	f. *corymbosa*
Podetia much fissured.	f. *fissa*
Podetia sterile.	f. *furcatosubulata*
Podetia squamulose.	f. *squamulifera*
Cortex broken by transverse splits.	var. *pinnata*
Podetia irregularly branched and swollen.	f. *turgida*
Podetia more or less brownish.	var. *palamaea*
Podetia esquamulose.	f. *subulata*
Podetia squamulose.	f. *rigidula*

19a. Cladonia furcata var. racemosa (Hoffm.) Floerke

PENNSYLVANIA: No locality cited (*Schweinitz*, without date, AS.). ALLEGHENY: Near Carnot (*J. A. Shafer*, 1888, C. det. Merrill), Montrose (*Jennings*, 1908, C. det. Merrill), Wildwood (*Wm. Milward*, 1919, C.), Fern Hollow, Pittsburgh (*Jennings* and *Kinzer*, 1905, C. det. Merrill). BERKS: Birdsboro (1939). BUCKS: Haycock Mt. (*Geo. B. Kaiser*, 1910, P., and SMS. det. Mary Miller). BUTLER: Nixon Station (*Milward*, 1919, C.). CENTER: In Giardini's Report in Bryologist, Sept., 1922, and Tussey Mt. near Shingletown (*Jennings*, 1919, C.). CHESTER: No locality cited (Listed by Michener in Flora Cestrica). No specimen in D. so labelled. However, the two following specimens there prove to be of this variety: "*Cladonia furcata* Floerk. var. δ. *subulata* Floerk. New Garden, Ex. Herb. E. Michener", and "*Cladonia furcata* var. α. *crispata* Floerk. ?"). CLINTON: Renovo (*Jennings*, 1908, C. det. Merrill). CRAWFORD: Pymatuming Swamp, Linesville (*Jennings*, 1905, C. det. Merrill). DAUPHIN: Deodate (1941). FAYETTE: Connellsville (*Thos. G. Lea*, 1841, AS.). HUNTINGDON: Nature Camp (*Thomson*, 1937). LAWRENCE: Slippery Rock (*Susan Gageby*, 1906, C., det. Merrill). LEBANON: Mt. Gretna (1941). LEHIGH: Blue Mt. (*Torrey*, 1933). LYCOMING: Hepburnville (1941). MONROE: Marshall's Creek (*Torrey*, 1937), and Poconos (*Evans*, 1941). PHILADELPHIA: Philadelphia (*Miss Morris*, 1935, NY.). PIKE: Near Newfoundland (*Evans*, 1941). SNYDER: Beaver Springs (1941). SULLIVAN: Eagles Mere (*Torrey*, 1937). TIOGA: Liberty (*Torrey*, 1937). WASHINGTON: Charleroi (*Jennings* and *Kinzer*, 1905, C.). WAYNE: White Mills (*Torrey*, 1937), Shehawken (1939). YORK: Bryansville (*Nearing*, 1940).

19aa. Cladonia furcata var. racemosa f. corymbosa (Ach.) Vainio

BRADFORD: Armenia Mt. (*Nearing*, 1939). SUSQUEHANNA: Starrucca Depot (1941). WAYNE: Shehawken (1939).

19ab. Cladonia furcata var. racemosa f. squamulifera Sandst.

BRADFORD: Burlington, Cedar Ledge, and Armenia Mt. (*Nearing*, 1939). BUCKS: Dolington (1939). CENTER: No locality cited (*Margaret Fulford*, 1932, det. Sandstede). LACKAWANNA: Moscow (*Nearing*, 1939). LANCASTER: Wrightsdale and Wakefield (*Nearing*, 1939). LEHIGH: Blue Mt. (*Torrey*, 1933). LUZERNE: Pike's Creek (*Nearing*, 1939). LYCOMING: Ellenton (*Nearing*, 1939). MONROE: Marshall's Creek (*Torrey*, 1937), Water Gay (1941), Poconos (*Evans*, 1941), and Scotrun (*Nearing*, 1939). PIKE: Bushkill Falls (1940). SNYDER: Beaver Springs (1941). SULLIVAN: Eagles Mere (*Torrey*, 1937) and Forksville and Beatrice (*Nearing*, 1939). SUSQUEHANNA: Starrucca Depot (1939). TIOGA: Harrison State Park (*Nearing*, 1939). UNION: Foresthill (1941). WAYNE: Shehawken (1939), Galilee (*Nearing*, 1939), and White Mills (*Torrey*, 1937). WYOMING: Nicholson (1941).

19ac. Cladonia furcata var. racemosa f. furcatosubulata (Hoffm.) Vainio

LANCASTER: Wakefield (*Nearing*, 1940).

19ad. Cladonia furcata var. racemosa f. fissa (Floerke) Aigret

COLUMBIA: Buck Glen (1941). SUSQUEHANNA: Starrucca Depot (1941). WAYNE: Shehawken (1939), Galilee (*Nearing*, 1939).

19b. Cladonia furcata var. pinnata (Floerke) Vainio

ALLEGHENY: Stoop's Ferry (*O. E. Jennings*, 1905, C., det. Merrill). CHESTER: The specimen in D. labelled "Cladonia squamosa var. β. attenuata (Fr.)" appears to belong in this group. FAYETTE: Ohiopyle (*O. E. Jennings*, 1905, and 1908, C., det. Merrill). HUNTINGDON: Nature Camp (*Thomson*, 1937). WESTMORELAND: Idlewild (*D. R. Sumstine*, 1907, C., det. Merrill).

19ba. Cladonia furcata var. pinnata f. turgida (Scriba) Sandstede

LEBANON: Mt. Gretna (1941).

19c. Cladonia furcata var. cristata Fr.

This is a fertile form of the species, resembling f. *corymbosa*.

CHESTER: In Darlington's Fl. C. as "Var. β. cristata". No specimen in D. FAYETTE: Connellsville (*Thos. G. Lea*, 1841 (?), AS.). This specimen is likely to be *C. furcata* var. *racemosa*, f. *fissa*.

19d. Cladonia furcata var. crispata (Ach.) Floerke

C. furcata var. *crispata* is a synonym for *C. furcata* var. *cristata*.

CHESTER: Michener's specimen in D. proves to be var. *racemosa*. FAYETTE: Connellsville (*Thos. G. Lea*, 1841 (?), AS.).

19ea. Cladonia furcata var. palamaea (Ach.) Vainio

LACKAWANNA: Moscow (*Nearing*, 1939). WAYNE: Shehawken (1940).

19eb. Cladonia furcata var. palamaea f. rigidula (Mass.) Vainio

MONROE: Poconos (*Evans*, 1941).

20a. Cladonia scabriuscula f. farinacea (Vainio) Sandst.

This is the characteristic form found in Pennsylvania. It is marked by an abundance of soredia and esquamulose podetia, or with a few squamules toward the base.

HUNTINGDON: Nature Camp (*Thomson*, 1939). LACKAWANNA: Moscow (*Nearing*, 1939). MONROE: Poconos (*Evans*, 1941). PIKE: Lake Wallenpaupack (*Torrey*, 1937), Bushkill Falls (1940). SUSQUEHANNA: Starrucca Depot (1941). WAYNE: Shehawken (1939). WYOMING: Lake Carey and Nicholson (1941).

21a. Cladonia multiformis f. Finkii (Vainio) Evans

In f. *Finkii* the ultimate proliferations are irregularly cylindrical; the branches are often fissured laterally.

BRADFORD: Armenia Mt. (*Nearing*, 1939). LACKAWANNA: Moscow (*Nearing*, 1939). MONROE: Pocono Mt. (*Torrey*, no date). LUZERNE: Pike's Creek (*Nearing*, 1939). SUSQUEHANNA: Starrucca Depot (1939). WAYNE: Shehawken (1939), and Galilee (*Nearing*, 1939).

21b. Cladonia multiformis f. subascypha (Vainio) Evans

In this form the cups are not very distinct, and often seem to be broken up into branches, and to create corymbose clusters of branchlets.

LACKAWANNA: Moscow (*Nearing*, 1939). SULLIVAN: Eagles Mere (*Torrey*, 1937). WAYNE: Shehawken (1939).

21c. Cladonia multiformis f. simulata Robbins

The podetia in this form proliferate repeatedly, and the proliferations of ultimate rank terminate in numerous very small cups.

WAYNE: Shehawken (1940).

21d. Cladonia multiformis f. subtestacea (Vainio) Evans

Much like f. *Finkii*, except that the podetia are brownish.

WAYNE: Shehawken (1940).

22a. Cladonia floridana f. typica Robbins

The podetia in this form are both fertile and squamulose.

MONROE: Poconos (*Evans*, 1941).

22b. Cladonia floridana f. elegans Robbins

In contrast to f. *typica*, the podetia in this form are sterile.

MONROE: Poconos (*Evans*, 1941).

The recent collection of *Cladonia floridana* from the Kittatinny Mts., from the Shawangunks, and this last from the Poconos, seem to indicate that this species, formerly regarded as a southern, coastal plant, may have a much more extensive range. Its previously limited occurrence may be due in part to its similarity to some forms of *C. squamosa*. The K yellow and P orange-red reaction of *C. floridana* will consistently separate these species.

23. Cladonia squamosa (Scop.) Hoffm.

BRADFORD: Cedar Ledge and Armenia Mt. (*Nearing*, 1939). CENTER: No locality cited (*Margaret Fulford*, 1932), State College (*G. I. Hastings*, without date). HUNTINGDON: Nature Camp (*Thomson*, 1937). LACKAWANNA: Moscow (*Nearing*, 1939). LANCASTER: Octoraro Creek, s. of Christiana (*J. K. Small*, 1893, NY.), McCall's Ferry (*Small*, 1892, SI.), Lancaster (*H. E. Hoover*, 1933, det. Evans). MONROE: Scotrun (*Nearing*, 1939). MONT-

GOMERY: Gladwyne (*Geo. B. Kaiser*, 1910, SMS. det. Fink). PIKE: Matamoras (*A. Schneider*, 1896, NY.). SNYDER: Beaver Springs (1941). SULLIVAN: Forksville and Bernice (*Nearing*, 1939). TIOGA: Harrison State Park (*Nearing*, 1939). WAYNE: Galilee (*Nearing*, 1939).

Key to forms and modifications of *C. squamosa:*

Podetia with cups.	
Podetia decorticate above.	
Podetia densely squamulose with small squamules.	f. *squamosissima*
Podetia naked, or sparingly squamulose.	f. *denticollis*
Podetia corticate throughout.	
Podetia whitish, or ashy; squamules large.	f. *phyllocoma*
Podetia glaucescent, or brownish; naked, or with medium-sized squamules.	
Podetia more than 7 mm. in height.	f. *levicorticata*
Sterile.	
Esquamulose; cups regular.	m. *pseudocrispata*
Often squamulose; cups bearing marginally short, rigid proliferations.	m. *rigida*
With apothecia.	m. *pityrea*
Podetia less than 7 mm. in height.	f. *epiphylla*
Podetia without cups.	
Podetia 2-8 mm. in height; primary thallus persistent; occasionally cup-forming.	f. *phyllopoda*
Podetia 7-25 mm. in height; usually without primary thallus; podetia densely squamulose.	f. *clavariella*

23aa. Cladonia squamosa f. levicorticata m. rigida (Del.) Evans

BUCKS: Morrisville (1939). HUNTINGDON: Nature Camp (*Thomson*, 1937). MONROE: Blakeslee (*Torrey*, 1936), Poconos (*Evans*, 1941). PIKE: Bushkill Falls (1940). SUSQUEHANNA: Starrucca Depot (1940). WAYNE: Shehawken (1940), Lakewood (1941).

23ab. Cladonia squamosa f. levicorticata m. pityrea (Arn.) Evans

CHESTER: Nottingham (*Nearing*, 1940). HUNTINGDON: Nature Camp (*Thomson*, 1937). MONROE: Poconos (*Evans*, 1941). WAYNE: Shehawken (1939).

23ac. Cladonia squamosa f. levicorticata m. pseudocrispata Sandst.

MONROE: Poconos (*Evans*, 1941).

23b. Cladonia squamosa f. squamosissima Floerke

FAYETTE: Ohiopyle (*D. R. Sumstine*, 1906, C., det. Merrill). SOMERSET: Somerset (*Sumstine*, 1906, C., det. Merrill). WESTMORELAND: Idlewild (*Sumstine*, 1906, C., det. Merrill).

23c. Cladonia squamosa f. phyllocoma (Rabenh.) Vainio

HUNTINGDON: Nature Camp (*Thomson*, 1937).

23d. Cladonia squamosa f. epiphylla (Arn.) Sandst.

MONROE: Poconos (*Evans*, 1941).

23e. Cladonia squamosa f. clavariella Vainio

PIKE: Shohola Falls (*Torrey*, 1937, det. Sandstede).

23f. Cladonia squamosa f. denticollis (Hoffm.) Floerke

SOMERSET: Somerset (*D. R. Sumstine*, 1906, C., det. Merrill).

23g. Cladonia squamosa f. phyllopoda Vainio

TIOGA: Liberty (*Torrey*, 1937).

Two additional forms of *C. squamosa* are listed in Darlington's Fl. C., as follows: *Cladonia squamosa* var. a. *ventricosa* and var. b. *attenuata*. No specimen in D. for the former. See 19b for the latter.

24. Cladonia cenotea (Ach.) Schaer.

LANCASTER: Martic Forge (*J. K. Small*, 1892, SI.).

24a. Cladonia cenotea f. crossota (Ach.) Nyl.

The typical form in this region. Slender, sorediose, open cups, with slightly involute margins.

WAYNE: Shehawken (1941), Lake Hiawatha, and Pleasant Valley Road (1942).

25. Cladonia delicata (Ehrh.) Floerke

CHESTER: Chester Creek (*Geo. B. Kaiser*, 1911, P., SMS.), Nottingham (*Nearing*, 1940). SOMERSET: Keystone (*Jennings*, 1904, C.). SULLIVAN: Bernice (*Nearing*, 1939). WAYNE: Galilee (*Nearing*, 1939).

25a. Cladonia delicata f. quercina (Pers.) Vainio

This is the normal form in Pennsylvania. The podetia are covered with granular soredia.

BRADFORD: Cedar Ledge and Armenia Mt. (*Nearing*, 1939). CENTER: Bear Meadows (*Thomson*, 1937). LYCOMING: Ellenton (*Nearing*, 1939). MONROE: Scotrun (*Nearing*, 1939). PIKE: Bushkill Falls (1940, and *Thomson*, 1940). SULLIVAN: Bernice (*Nearing*, 1939). SUSQUEHANNA: Starrucca Depot (1941).

26. Cladonia caespiticia (Pers.) Floerke

BERKS: Monterey (*Mrs. E. C. White*, 1936, SI., det. Evans). BRADFORD: Armenia Mt. (*Nearing*, 1939). BUCKS: Morrisville (1939). CENTER: Bear Meadows (*Thomson*, 1937). CHESTER: Avondale Quarry (*A. F. K. Krout*, without date, P.). Listed in Darlington's Fl. C. No specimen in D. CRAWFORD: Pymatuming Swamp, Linesville (*Jennings*, 1907, C.). FAYETTE: Ohiopyle (*Jennings*, 1906, C.). HUNTINGDON: Nature Camp (*Thomson*, 1937). JUNIATA: Cuba Mills (1941). LANCASTER: Wrightsdale (*Nearing*, 1939). LUZERNE: Pike's Creek (*Nearing*, 1939). MONROE: Poconos (*Evans*, 1941). PIKE: Bushkill Falls (1939). SNYDER: Beaver Springs (1941). SULLIVAN: Eagles Mere (*Torrey*, 1937). WAYNE: Shehawken (1939), and Galilee (*Nearing*, 1939).

Group 2. Megaphyllae

27. Cladonia apodocarpa Robbins

BRADFORD: Cedar Ledge (*Nearing*, 1939). CHESTER: Nottingham (*Nearing*, 1940). COLUMBIA: Buck Glen (1941). LANCASTER: Wakefield (*Nearing*, 1939). LEBANON: Mt. Gretna (1941). MONROE: Poconos (Evans, 1941). MONTOUR: Washingtonville (1941). SNYDER: Beaver Springs (1941). SULLIVAN: Forksville (*Nearing*, 1949). WAYNE: Shehawken (1939). YORK: Delta (*Nearing*, 1940).

28. Cladonia turgida (Ehrh.) Hoffm.

PENNSYLVANIA: No locality cited (*Tuckerman*. Listed in his Syn. of Am. Lich., 1848, but accredited to Muhlenberg). FAYETTE: Ohiopyle (*Jennings*, 1905, C., det. Merrill). WAYNE: Shehawken (1939).

28a. Cladonia turgida f. corniculata Floerke

With cupless and esquamulose podetia.

MONROE: Poconos (*Evans*, 1941). WAYNE: Shehawken (1940).

28b. Cladonia turgida f. scyphifera Vainio

Podetia in this form are cup-forming, and the cups may proliferate.

WAYNE: Shehawken (1940).

28c. Cladonia turgida f. squamulosa (Rabenh.) Theobald

The podetia are cupless and densely squamulose.

MONROE: Poconos (*Evans*, 1941). WAYNE: Shehawken (1942).

Subsection 3. Clausae

Group 1. Podostelides

Subgroup 1. Helipodium

29. Cladonia mitrula Tuckerman

PENNSYLVANIA: No location cited (*Schweinitz*, no date, AS.), also listed by Fink in Bryologist, July, 1906. BERKS: Wernersville (*Mary E. Williams*, 1909, SMS., det, Mary F. Miller). BUCKS: Nockamixon (*Geo. B. Kaiser*, 1910, P.). CHESTER: No location cited (*E. Michener*, in Flora Cestrica). No specimen in D. I believe this publication of *C. mitrula* in Flora Cestrica is the original description of this species. DELAWARE: No locality cited (*J. W. Eckfeldt*, without date, AS.). ERIE: Presque Isle (*O. E. Jennings*, 1905, C., det. Merrill). LYCOMING: Hepburnville (1941). MONTGOMERY: Haverford (*Eckfeldt*, 1882, AS.). WAYNE: Shehawken (1939).

29a. Cladonia mitrula f. imbricatula Vainio

The apothecia in this form are few, large, and pale brown to dark brown.

BERKS: Birdsboro (1940). BRADFORD: Armenia Mt. (*Nearing*, 1939). BUCKS: Newtown and Morrisville (1939). CHESTER: Nottingham (*Nearing*, 1940). DAUPHIN: Deodate (1941). DELAWARE: Chadd's Ford (*E. C.* and *Grace M. Leonard*, 1928, SI. det. Evans). HUNTINGDON: Nature Camp (*Thomson*, 1937). LEBANON: Mt. Gretna (1941). LEHIGH: Blue Mt. (*Torrey*, 1933). LUZERNE: Pike's Creek (*Nearing*, 1939). MIFFLIN: Maitland (1941). MONROE: Scotrun (*Nearing*, 1939). Pocono Mts. (*Dillman*, 1934), and Poconos and Water Gap (*Evans*, 1941). NORTHAMPTON: Wind Gap (1941). PERRY: Sterrett's Gap (1941). PHILADELPHIA: Pennypack Creek (1942). PIKE: Lake Wallenpaupack and Shohola Falls (*Torrey*, 1937), Bushkill Falls (*Evans*, 1941). SCHUYLKILL: Zion's Grove (1941). WAYNE: Shehawken (1939). YORK: Near York (1941), and Delta (*Nearing*, 1940).

29b. Cladonia mitrula f. pallida Robbins

In this form the apothecia differ from f. *imbricatula* only in being flesh-colored.

HUNTINGDON: Nature Camp (*Thomson*, 1937). LANCASTER: Wrightsdale (*Nearing*, 1939). LYCOMING: Hepburnville (1941). MONROE: Poconos (*Evans*, 1941).

29c. Cladonia mitrula f. squamulosa Merrill

This form can be distinguished by the squamulose podetia.

MONROE: Poconos and Water Gap (*Evans*, 1941).

30. Cladonia clavulifera Vainio

BRADFORD: Cedar Ledge (*Nearing*, 1939).

30a. Cladonia clavulifera f. nudicaulis Evans

The podetia in this form are without squamules.

CHESTER: Nottingham (*Nearing*, 1940). PIKE: Near Newfoundland (*Evans*, 1941). TIOGA: Liberty (*Torrey*, 1937). WYOMING: Nicholson (1941).

30b. Cladonia clavulifera f. pleurocarpa Robbins

This form is distinguished by the presence of many small apothecia and the almost cup-like appearance of the apex.

SULLIVAN: Bernice (*Nearing*, 1939). WAYNE: Shehawken (1940). WYOMING: Nicholson (1941).

30c. Cladonia clavulifera f. subvestita Robbins

This form has squamulose podetia.

HUNTINGDON: Nature Camp (*Thomson*, 1937). PERRY: Sterrett's Gap (1941). PIKE: Near Newfoundland (*Evans*, 1941). TIOGA: Liberty (*Torrey*, 1937).

31. Cladonia subcariosa Nyl.

ALLEGHENY: Coraopolis (*Jennings*, 1905, C., det. Merrill). BRADFORD: Cedar Ledge and Burlington (*Nearing*, 1939). LANCASTER: McCall's Ferry (*A. A. Heller*, listed by Merrill in Bryologist, May, 1909). LYCOMING: Ellenton (*Nearing*, 1939). MONROE: Water Gap (*Evans*, 1941). PIKE: Bushkill Falls (1939).

The four forms of *C. subcariosa* found in Pennsylvania may be separated as follows:

Podetia without squamules.	f. *evoluta*
Podetia squamulose.	f. *squamulosa*
Apothecia sessile on primary squamules.	f. *epiphylla*
Apex of the podetia almost cup-like, and bearing many small apothecia.	f. *pleurocarpa*

31a. Cladonia subcariosa f. evoluta Vainio

BRADFORD: Cedar Ledge and Armenia Mt. (*Nearing*, 1939). BUCKS: Morrisville and Washington's Crossing (1940). CHESTER: Nottingham (*Nearing*, 1940). DAUPHIN: Deodate (1941). HUNTINGDON: Nature Camp and Penn. State Research Forest (*Thomson*, 1937). LEBANON: Mt. Gretna (1941). MONROE: Poconos (*Evans*, 1941). PERRY: Sterrett's Gap (1941). PHILADELPHIA: Near Bustleton (1941). PIKE: Lake Wallenpaupack (*Torrey*, 1937). WAYNE: Shehawken (1941). WYOMING: Lake Carey (1941). YORK: Delta (*Nearing*, 1940).

31b. Cladonia subcariosa f. squamulosa Robbins

BERKS: Birdsboro (1940). BUCKS: Morrisville (1940). DAUPHIN: Deodate (1941). MONROE: Poconos (*Evans*, 1941). PHILADELPHIA: Near Bustleton (1941).

31c. Cladonia subcariosa f. epiphylla Robbins

HUNTINGDON: Nature Camp (*Thomson*, 1937).

31d. Cladonia subcariosa f. pleurocarpa Robbins

BRADFORD: Armenia Mt. (*Nearing*, 1939). BUCKS: Morrisville and New Hope (1941). HUNTINGDON: Nature Camp (*Thomson*, 1937). PIKE: Bushkill Falls (1940). WAYNE: Shehawken (1941). YORK: Delta (*Nearing*, 1940).

Cladonia symphicarpa Fr.

Since the validity of this species is questioned by most American systematists at present, the existence of these specimens is merely recorded at this place.

BUCKS: Haycock Mt. (*J. W. Eckfeldt,* 1883, AS.). LEHIGH: No locality cited (*Eckfeldt,* 1883, AS.).

32. Cladonia cariosa (Ach.) Spreng.

ALLEGHENY: Wildwood (*Wm. Milward,* 1919, C.). BUTLER: Nixon Station (*Milward,* 1917, C.).

Subgroup 2. Macropus

33. Cladonia acuminata (Ach.) Arn.

WAYNE: Pleasant Valley Road, near Twp. line, Scott Township (1940 and 1942).

The occurrence of *C. acuminata* in Pennsylvania is unusual, as it is generally considered a species of more northern distribution.

Group 2. Thallostelides

34. Cladonia gracilis (L.) Willd.

PENNSYLVANIA: No location cited (*Tuckerman* in Syn. Am. Lich., 1848). Cited by Tuckerman from Muhlenberg's list.

34a. Cladonia gracilis var. dilatata (Hoffm.) Vainio

This is the only variety found in Pennsylvania. It has relatively stout podetia.

BRADFORD: Cedar Ledge and Armenia Mt. (*Nearing,* 1939). HUNTINGDON: Nature Camp (*Thomson,* 1937). LYCOMING: Ellenton (*Nearing,* 1939). MONROE: Poconos (*Evans,* 1941). SULLIVAN: Bernice (*Nearing,* 1939). SUSQUEHANNA: Starrucca Depot (1941). TIOGA: Liberty (*Torrey,* 1937). WAYNE: Shehawken (1939). Galilee (*Nearing,* 1939).

34aa. Cladonia gracilis var. dilatata f. squamulosa (Schaer.) Sandst.

The podetia in this form are sterile, and densely squamulose to the middle.

BRADFORD: Cedar Ledge (*Nearing,* 1939). LACKAWANNA: Moscow (*Nearing,* 1939). PIKE: Bushkill Falls (*Nearing,* 1941). WAYNE: Shehawken (1940).

34ab. Cladonia gracilis var. dilatata f. anthocephala (Floerke) Vainio.

In f. *anthocephala* the cups are regular and bear apothecia.

BRADFORD: Armenia Mt. (*Nearing,* 1939). MONROE: Blakeslee (*Torrey,* 1936). SNYDER: Beaver Springs (1941). UNION: Foresthill (1941).

34ac. Cladonia gracilis var. dilatata f. dilacerata (Floerke) Vainio.

In this form the cups are irregular, often with deep marginal indentations.

HUNTINGDON: Nature Camp (*Thomson,* 1937). SULLIVAN: Bernice (*Nearing,* 1939).

34b. Cladonia gracilis campthosa Wain.

No description of this form was found.

CHESTER: Phoenixville (*Geo. B. Kaiser,* 1910, SMS.). This specimen was first identified as *C. fimbriata.* This was crossed out, and determined as above, with the note, " det. Fink, provisionally ".

34c. Cladonia gracilis " Var. a. cervicornis " (Ash.) Schaer.

Now known as *C. verticillata* var. *cervicornis*. It has larger primary squamules but shorter podetia than f. *evoluta*.

CHESTER: Listed in Darlington's Flora Cestrica.

35. Cladonia verticillata (Hoffm.) Schaer.

PENNSYLVANIA: No locality cited (Listed by Fink in Bryologist, Nov., 1904). ALLEGHENY: Wildwood (*Wm. Milward*, 1919, C.). ARMSTRONG: In Giardini's Report, Bryologist, Sept., 1922. BRADFORD: In Giardini's Report, Bryologist, Sept., 1922. BUCKS: Morrisville (1940). BUTLER: Nixon Station (*Milward*, 1919, C.). CRAWFORD: In Giardini's Report, Bryologist, Sept., 1922. ERIE: Presque Isle (*Jennings*, 1906, C., det. Merrill). HUNTINGDON: Nature Camp (*Thomson*, 1937). MIFFLIN: Maitland (1941). PIKE: Bushkill Falls (1940). SULLIVAN: Wheelersville (*Torrey*, 1937). SUSQUEHANNA: Starrucca Depot (1941). TIOGA: Liberty (*Torrey*, 1937).

35a. Cladonia verticillata f. evoluta (Th. Fr.) Stein

In this form the podetia are without squamules, and the proliferations are all central.

BRADFORD: Cedar Ledge and Burlington (*Nearing*, 1939). BUCKS: Haycock Mt. (*Geo. B. Kaiser*, 1910, SMS., det Mary Miller). CHESTER: Nottingham (*Nearing*, 1940). COLUMBIA: Buck Glen (1941). DAUPHIN: Deodate (1910). HUNTINGDON: Nature Camp (*Thomson*, 1937). LEBANON: Mt. Gretna (1941). LEHIGH: Blue Mt. (*Torrey*, 1933). LUZERNE: Pike's Creek (*Nearing*, 1939). LYCOMING: Ellenton (*Nearing*, 1939), Hepburnville (1941). MONROE: Pocono Mts. (*Dillman*, 1934), Poconos (*Evans*, 1941). MONTOUR: Washingtonville (1941). NORTHUMBERLAND: Turbotville (1941). PERRY: Sterrett's Gap (1941). PIKE: Shohola Falls and Lake Wallenpaupack (*Torrey*, 1937), Bushkill Falls (*Evans*, 1941). SULLIVAN: Eagles Mere (*Torrey*, 1937), Bernice and Forksville (*Nearing*, 1939). TIOGA: Harrison State Park (*Nearing*, 1940). UNION: Foresthill (1941). WAYNE: Shehawken (1939), Galilee (*Nearing*, 1939). WYOMING: Nicholson (1941). YORK: Delta (*Nearing*, 1940).

35b. Cladonia verticillata f. apoticta (Ach.) Vainio

The proliferations in this form are in part marginal or lateral.

CHESTER: Nottingham (*Nearing*, 1940). DAUPHIN: Deodate (1941). MONROE: Scotrun (*Nearing*, 1939). PERRY: Sterrett's Gap (1941). PIKE: Lake Wallenpaupack (*Torrey*, 1937). WAYNE: Shehawken (1940).

35c. Cladonia verticillata f. aggregata (Del.) Oliv.

In this form the proliferations are very numerous and close together.

DAUPHIN: Deodate (1941). LEBANON: Mt. Gretna (1941). LYCOMING: Hepburnville (1941). MONROE: Poconos (*Evans*, 1941). NORTHUMBERLAND: Turbotville (1941). PERRY: Sterrett's Gap (1941). PIKE: Lake Wallenpaupack (*Torrey*, 1937). SULLIVAN: Bernice and Forksville (*Nearing*, 1939). UNION: Foresthill (1941). WAYNE: Shehawken (1940).

35d. Cladonia verticillata f. phyllocephala (Flot.) Oliv.

In this form the podetia are somewhat squamulose.

HUNTINGDON: Nature Camp (*Thomson*, 1937). LEHIGH: Blue Mt. (*Torrey*, 1933). LUZERNE: Pike's Creek (*Nearing*, 1939). MONROE: Poconos (*Evans*, 1941). WAYNE: Shehawken (1940).

35e. Cladonia verticillata " cervicornis " (Ach.) Floerke

This form has larger primary squamules, but shorter podetia than f. *evoluta*.

MONTGOMERY: Gladwyne (*Geo. B. Kaiser*, 1910, SMS., det. Mary Miller, and P., det. Fink).

36. Cladonia calycantha Del.

WAYNE: Shehawken (1940).

37a. Cladonia degenerans f. phyllophora (Ehrh.) Flot.

This form has indistinct cups, and podetia without squamules. This is the characteristic form in Pennsylvania.

MONTOUR: Washingtonville (1941). UNION: Foresthill (1941). WAYNE: Shehawken (1940) and Lakewood (1941).

38a. Cladonia mateocyatha f. squamulata Robbins

Characterized by the presence of squamules on the podetia and margins of cups.

CHESTER: Nottingham (*Nearing*, 1940). LANCASTER: Wakefield (*Nearing*, 1940).

39. Cladonia pyxidata (L.) Hoffm.

This species was formerly a very comprehensive one, including the *C. chlorophaea-Grayi* group. All specimens observed which were definitely labelled "*Cladonia pyxidata chlorophaea*" will be listed under *C. chlorophaea.*

BERKS: Woods near Pulpit Rocks (*N. L. Britton*, without date, No. 360, NY.). [CHESTER: One of Michener's specimens in D. labelled "*C. pyxidata*" proves to be *C. chlorophaea* f. *simplex;* the other is *C. pleurota.* The record of *C. pyxidata* in Flora Cestrica may refer to one of these specimens.] DELAWARE: No locality cited (*J. W. Eckfeldt,* 1878, AS.). Darby Creek (*Josephine Lowe*, 1889, P. This specimen is labelled "*Cladonia pyxillata*", but appears to be *C. mitrula*). ERIE: No locality cited (*Gustave Guttenberg*, 1878-9. Listed in Giardini's Record, Bryologist, Sept., 1922 as "Cladonia pyxidata staphylea", with note, "determination doubtful".). LANCASTER: McCall's Ferry and Conewago (*A. A. Heller*, 1892, NY. and SI.), Safe Harbor (*J. K. Small*, 1890, NY.). MONTGOMERY: Haverford (*Eckfeldt*, 1881, AS.).

39a. Cladonia pyxidata var. neglecta (Floerke) Mass.

The characteristic plant in Pennsylvania. It has the primary squamules free and ascending.

ALLEGHENY: Power's Run, Montrose, and Schenley Park (*Jennings*, 1905, C., det. Merrill), Wildwood (*Wm. Milward*, 1919, C.). BEAVER: New Galilee (*Jennings*, 1906, C., det. Merrill). BUTLER: Nixon Station (*Milward*, 1917-19, C.). CAMBRIA: Cresson (*Jennings*, 1904, C.). CENTER: No locality cited. In Giardini's Report, Bryologist, Sept., 1922. CRAWFORD: Pymatuming Swamp (*Jennings*, 1906, C., det. Merrill). ERIE: Presque Isle (*Jennings*, 1906, C., det. Merrill), Corry (*D. R. Sumstine*, 1908, C., det. Merrill). FAYETTE: Ohiopyle (*Jennings*, 1906, C., det. Merrill). HUNTINGDON: Nature Camp (*Thomson*, 1937). JEFFERSON: Brookville (*A. R. Hillard*, 1917, C.). SOMERSET: Ursina (*Jennings*, 1905, C., det. Merrill). WASHINGTON: No locality cited. In Giardini's Report, Bryologist, Sept., 1922. WAYNE: Shehawken (1940). WESTMORELAND: New Florence (*Jennings*, 1907, C., det. Merrill), Derry (*Sumstine*, 1905, C., det. Merrill).

39aa. Cladonia pyxidata var. neglecta f. simplex (Ach.) Harm.

This form has esquamulose podetia.

MONROE: Water Gap and Poconos (*Evans*, 1941). PERRY: Sterrett's Gap (1941). PIKE: Near Newfoundland (*Evans*, 1941). SULLIVAN: Forksville (*Nearing*, 1939). WYOMING: Nicholson (1941).

39ab. Cladonia pyxidata var. neglecta f. lophyra (Ach.) Koerb.

In this form the podetia are squamulose.

WAYNE: Shehawken (1941).

39ac. Cladonia pyxidata var. neglecta f. centralis (Flot.) Koerb.

This is a rare and unusual form with a central proliferation.

WAYNE: Shehawken (1941).

40. Cladonia chlorophaea (Floerke) Spreng.

All specimens labelled "*Cladonia pyxidata chlorophaea*" are listed here.

ALLEGHENY: Stoop's Ferry, and Montrose (*Jennings*, 1905, C., det. Merrill), near Carnot (*J. A. Shafer*, 1888, C., det. Merrill), Wildwood (*Wm. Milward*, 1919, C.). ARMSTRONG: Clinton (*Jennings*, 1921, C.). BEDFORD: Will's Mt., Hyndman (*Jennings*, 1904, C., det. Merrill). BERKS: Wernersville (*Mary E. Williams*, 1909, SMS., det. Mary F. Miller). BUCKS: Morrisville (1939). BUTLER: Nixon Station (*Milward*, 1917, C.), Wolf Creek Valley (*S. H. Williams*, 1921, C.). HUNTINGDON: Tussey's Mt. (*Jennings*, 1909, C., det. Merrill), Nature Camp (*Thomson*, 1939). LEHIGH: Blue Mt. (*Torrey*, 1933, det. Sandstede). SULLIVAN: Wheelerville (*Torrey*, 1937), Forksville (*Nearing*, 1939). TIOGA: Liberty (*Torrey*, 1937, det. Sandstede). WASHINGTON: In Giardini's Report, Bryologist, Sept., 1922. WAYNE: White Mills (*Torrey*, 1937).

The following key can be used for the different forms of *C. chlorophaea*.

Podetia sterile.	
Podetia free from squamules except a few at base.	
Cups without proliferations.	f. *simplex*
Very similar, but with larger squamules; see also explanation to 40b.	f. *conistea*
Cups proliferous, proliferations often cup-forming.	f. *prolifera*
Podetia more or less squamulose throughout.	f. *pterygota*
Podetia fertile.	
Podetia free from squamules, or occasionally few at base.	f. *carpophora*
Podetia squamulose throughout.	f. *lepidophora*

40a. Cladonia chlorophaea f. simplex (Hoffm.) Arn.

BRADFORD: Armenia Mt. (*Nearing*, 1939). LUZERNE: Hepburnville (1941). MONROE: Scotrun (*Nearing*, 1939). SCHUYLKILL: Zion's Grove (1941).

40b. Cladonia chlorophaea f. conistea Del.

On the basis of micro-chemical tests, according to Dr. Evans, the first of the following specimens should be classified as *C. chlorophaea* f. *simplex;* the rest as *C. conista.* With this explanation, however, I am leaving them under f. *conistea.*

BUCKS: Bowman's Hill (1941). CLINTON: Logantown (1941). DAUPHIN: Deodate (1941). LEBANON: Mt. Gretna (1941). WAYNE: Shehawken (1939).

40c. Cladonia chlorophaea f. carpophora (Floerke) Anders.

BRADFORD: Cedar Ledge (*Nearing*, 1939). CENTER: Bear Meadows (*Thomson*, 1937). CLINTON: Logantown (1941). DAUPHIN: Deodate (1941). HUNTINGDON: Nature Camp and Ross Run (*Thomson*, 1939, 1937).

40d. Cladonia chlorophaea f. lepidophora (Floerke) Sandst.

WAYNE: Shehawken (1940).

40e. Cladonia chlorophaea f. prolifera (Wallr.) Arn.

HUNTINGDON: Nature Camp (*Thomson*, 1939).

40f. Cladonia chlorophaea f. pterygota (Floerke) Vainio

TIOGA: Harrison State Park (*Nearing*, 1939).

In the next two paragraphs are listed specimens which by the usual classification belong under *C. chlorophaea*, but have recently been segregated by the micro-chemical methods of Asahina,[1] a Japanese botanist, as follows:

(*C. Grayi* f. *aberrans*). The specimens in this group, though having a positive reaction with paraphenylenediamine, contain grayanic acid, according to Asahina's methods. BRADFORD: Cedar Ledge (*Nearing*, 1939). CENTER: Colyer Creek (*Zundel*, 1937). DAUPHIN: Deodate (1941). HUNTINGDON: Nature Camp (*Thomson*, 1939). LANCASTER: Wrightsdale (*Nearing*, 1939). LUZERNE: Pike's Creek (*Nearing*, 1939). LYCOMING: Warrensville (*Zundel*, 1936). MIFFLIN: Maitland (1941). MONROE: Water Gap and Poconos (*Evans*, 1941). MONTOUR: Washingtonville (1941). NORTHUMBERLAND: Turbotville (1941). PIKE: Bushkill Falls (*Nearing*, 1941), and near Newfoundland (*Evans*, 1941). SNYDER: Beaver Springs (1941). SULLIVAN: Bernice (*Nearing*, 1939). SUSQUEHANNA: Starrucca Depot (1941). TIOGA: Liberty (*Torrey*, 1937), Harrison State Park (*Nearing*, 1939). UNION: Foresthill (1941). WAYNE: White Mills (*Torrey*, 1937), Galilee (*Nearing*, 1939), Shehawken (1941). WYOMING: Nicholson (1941). YORK: Delta and Bryansville (*Nearing*, 1940).

(*C. cryptochlorophaea*). Also a micro-chemical segregation. BRADFORD: Burlington (*Nearing*, 1939). CHESTER: Nottingham (*Nearing*, 1940). LEBANON: Mt. Gretna (1941). MONROE: Mt. Pocono (*Torrey*, 1936). Poconos (*Evans*, 1941). LACKAWANNA: *Nearing*, 1939). LYCOMING: Ellenton (*Nearing*, 1939). PERRY: Sterrett's Gap (1941). SUSQUEHANNA: Starrucca Depot (1941).

41. Cladonia Grayi Merrill

This species, to a large extent, is merely a chemical segregation from *C. chlorophaea* by its reaction to P.

BRADFORD: Cedar Ledge and Armenia Mt. (*Nearing*, 1939). LYCOMING: Ellenton (*Nearing*). MONROE: Blakeslee (*Torrey*, 1936).

41a. Cladonia Grayi f. simplex Robbins

With esquamulose podetia, and usually sterile.

BUCKS: Morrisville and Newtown (1939), Bowman's Hill (1940). CHESTER: "New Garden" (*Michener*, no date; listed as *C. cornucupioides*. Specimen in D.) LUZERNE: Pike's Creek (*Nearing*, 1939). PIKE: Bushkill Falls (1941, and *Nearing*, 1941). SCHUYLKILL: Zion's Grove (1941). SUSQUEHANNA: Starrucca Depot (1941).

41b. Cladonia Grayi f. squamulosa Sandst.

BUCKS: Dolington (1939). LACKAWANNA: Moscow (*Nearing*, 1939). LANCASTER: Wrightsdale (*Nearing*, 1940). MONROE: Blakeslee (*Torrey*, 1936). WAYNE: Shehawken (1939), Galilee (*Nearing*, 1939).

41c. Cladonia Grayi f. carpophora Evans

This form is fertile, and esquamulose, with large apothecia.

LEBANON: Mt. Gretna (1941). LYCOMING: Hepburnville (1941). MONROE: Poconos (*Evans*, 1941). PIKE: Bushkill Falls (1941), and near Newfoundland (*Evans*, 1941). SCHUYLKILL: Zion's Grove (1941). SUSQUEHANNA: Starrucca Depot (1941). WAYNE: Shehawken (1940), Lakewood (1941).

---

[1] Bull. Torrey Bot. Club, Vol. 70, No. 2, pp. 139-151. 1943.

41d. Cladonia Grayi f. prolifera Sandst.

This form is sterile, esquamulose, and proliferous from margins of cups. The proliferations may also be cup-forming.

WAYNE: Shehawken (1940).

41e. Cladonia Grayi f. **carneopallida** f. nov.

This form is analogous to *C. chlorophaea* f. *carneopallida* (Ach.) Robbins, and is distinctive in having flesh-colored apothecia. Apotheciis carneopallidis.

BUCKS: Morrisville (1941).

42a. Cladonia conista f. simplex (Ach.) Robbins

In this form the podetia are sterile, without proliferations, or squamules.

BRADFORD: Armenia Mt. (*Nearing* (1939). LUZERNE: Pike's Creek (*Nearing*, 1939). MIFFLIN: Maitland (1941). MONROE: Poconos (*Evans*, 1941). NORTHAMPTON: Wind Gap (1941). PIKE: Bushkill Falls (1939, and *Evans*, 1941). UNION: Foresthill (1941). WAYNE: Shehawken (1940). YORK: near York (1941).

43. Cladonia fimbriata (L.) Fr.

This species originally included *C. nemoxyna, C. ochrochlora, C. coniocraea,* and *C. borbonica,* as varieties. If the original record listed such a variety, the specimen will be grouped according to the more recent segregations. Thus "*Cladonia fimbriata* var. *nemoxyna*" will be classified with *C. nemoxyna.*

PENNSYLVANIA: No locality cited (*Tuckerman* in Syn. Amer. Lich., 1948, and *Schweinitz*, no date, AS.). CHESTER: "New Garden" (*Michener,* without date; labelled "Cladonia cornuta Fr."). "Cladonia fimbriata var. a. radula" also appears in Flora Cestrica. CLINTON: Logantown (1941). DELAWARE: No locality cited (*J. W. Eckfeldt,* without date, AS.). HUNTINGDON: Nature Camp (*Thomson,* 1939). LUZERNE: Pike's Creek (*Nearing,* 1939). MONROE: Poconos (*Evans,* 1941). NORTHUMBERLAND: Turbotville (1941). WAYNE: Shehawken (1939), and Shrawder Mt. (1941). YORK: Bryansville (*Nearing,* 1940).

43a. Cladonia fimbriata f. apolepta (Ach.) Vainio

Now known as *C. coniocraea.*

ALLEGHENY: Wildwood (*Wm. Milward,* 1919, C.). GREENE: Halbrook (*Sarah A. Marley,* 1925, C.).

43b. Cladonia fimbriata f. fibula (Hoffm.) Nyl.

This form is synonymous with *C. nemoxyna* f. *fibula.* Fertile and without squamules, the apothecia either sessile on the cups, or borne on short stipes.

DELAWARE: Radnor Hunt (*Geo. B. Kaiser,* 1910, SMS., det. Mary Miller, ver. Fink). SOMERSET: (*D. R. Sumstine,* 1906, C.).

43c. Cladonia fimbriata "v. subcornuta" Nyl.

This form is probably synonymous with *C. cornutoradiata* f. *subulata* Vainio. Of doubtful identity.

BERKS: Wernersville (*Mary E. Miller,* 1909, SMS., det. H. E. H.). SOMERSET: No locality cited (*D. R. Sumstine,* 1906, C.).

43d. Cladonia fimbriata simplex (Weis.) Flot.

This form is probably synonymous with *C. fimbriata* f. *fibula*. With definite and well shaped cups.

BERKS: Wernersville (*Mary E. Williams*, 1900, SMS., det. Mary F. Miller).

44. Cladonia major (Hagen) Sandst.

This is a segregate from *C. fimbriata* partly on chemical differences. It also is a larger form, sometimes as much as 3 mm. in diameter and 40 mm. in height. The cups may be as much as 12 mm. wide at the mouth.

WAYNE: Winterdale (1942).

45. Cladonia nemoxyna (Ach.) Nyl.

PENNSYLVANIA: No locality cited (Fink in his Lichen Flora of the U. S., p. 266, as "Cladonia fimbriata var. nemoxyna"). This is the only reference by Fink to Pennsylvania Cladonia. BERKS: Birdsboro (1940). BRADFORD: Cedar Ledge and Armenia Mt. (*Nearing*, 1939). BUCKS: Bowman's Hill and Washington's Crossing (1940). CENTER: State College (*Miss F. Wiley*, 1937). CLINTON: Logantown (1941). DAUPHIN: Deodate (1941). HUNTINGDON: Nature Camp (*Thomson*, 1937). LUZERNE: Pike's Creek (*Nearing*, 1939). LYCOMING: Ellenton (*Nearing*, 1939). MIFFLIN: Maitland (1941). MONROE: Poconos and Water Gap (*Evans*, 1941), Scotrun (*Nearing*, 1939). PERRY: Sterrett's Gap (1941). PIKE: Bushkill Falls (*Thomson*, 1940, and *Evans*, 1941), and near Newfoundland (*Evans*, 1941). SCHUYLKILL: Zion's Grove (1941). SULLIVAN: Forksville (*Nearing*, 1939). SUSQUEHANNA: Starrucca Depot (1941). WAYNE: White Mills (*Torrey*, 1937).

45a. Cladonia nemoxyna f. fibula (Ach.) Vainio

In this form the podetia are without squamules, fertile, and bear apothecia on the margins of the cups or on short stipes.

HUNTINGDON: Nature Camp (*Thomson*, 1939). LYCOMING: Hepburnville (1941). NORTHAMPTON: Wind Gap (1941). PIKE: Bushkill Falls (1940), Lake Wallenpaupack (*Torrey*, 1937). WAYNE: Shehawken (1939), Galilee (*Nearing*, 1939). WYOMING: Lake Carey and Nicholson (1941).

45b. Cladonia nemoxyna f. Rei (Schaer.) Anders.

This form has in addition to the regular coarse granules a growth called *isidia*, resembling very large granules, or small squamules, and the podetia are more or less squamulose.

MONROE: Water Gap (*Evans*, 1941). WAYNE: Scott Township (1941).

46. Cladonia ochrochlora Floerke

A great deal of the material formerly classified under this species has recently been allocated to *C. coniocraea*. A re-examination of the material collected prior to 1930 would probably place most of it with that species. However, all specimens originally labelled *C. ochrochlora* are listed here according to that determination. The apparent distinction between the two species rests on the relative distribution of cortex and soredia. The four following collections are classified according to the more recent usage, and represent the true *C. ochrochlora*.

LUZERNE: Pike's Creek (*Nearing*, 1939). Bushkill Falls (*Nearing*, 1941). SUSQUEHANNA: Starrucca Depot (1941). WAYNE: Galilee (*Nearing*, 1939).

46a. Cladonia ochrochlora f. ceratodes Floerke

This form represents the form, in part, now classified as *C. coniocraea* f. *ceratodes.* It is marked by its subulate podetia, usually without squamules.

ALLEGHENY: Near Carnot (*J. A. Shafer*, 1888, C., det. Merrill), Fern Hollow, Pittsburg (*D. R. Sumstine*, 1906, C., det. Merrill, *Giardini*, 1921, C., and *Jennings, G. E. Kinzer*, 1905, C.), Power's Run Ravine (*Jennings* and *Kinzer*, 1905, C.), Trafford (*Jennings*, 1922, C.), Edgworth (*Jennings*, 1916, C.) and Wildwood (*Wm. Hilward*, 1919, C.). ARMSTRONG: In Giardini's Report, Bryologist, Sept., 1922. BEAVER: In Giardini's Report, Bryologist, Sept., 1922. BUTLER: Nixon Station (*Hilward*, 1917, C.). CENTER: Stormtown (*Miss H. E. Wilson*, 1902, C., det. Merrill). CRAWFORD: Pymatuming Swamp (*Jennings*, 1905, C., det. Merrill). ERIE: Presque Isle (*Jennings*, 1906, C.). FAYETTE: Ohiopyle (*Jennings* and *Kinzer*, 1905, C.). JEFFERSON: Near Brookville (*A. R. Hillard*, 1917, C.). SOMERSET: Somerset (*Sumstine*, 1906, C., det. Merrill). WASHINGTON: Van Emman (*Jennings*, 1908, C., det. Merrill). WESTMORELAND: Near Blackburn (*Jennings*, 1908, C., det. Merrill), Idlewild (*Sumstine*, 1906, C., det. Merrill).

46b. Cladonia ochrochlora f. truncata Floerke

This form is the same as that represented by *C. coniocraea f. truncata*, and cf. that form below.

ALLEGHENY: Stoop's Ferry (*Jennings* and *Kinzer*, 1905, C.). ERIE: Presque Isle (*Jennings*, 1905, C.).

46c. Cladonia ochrochlora f. paraphyonema Floerke

Of this form Dr. Evans writes, " This is an unusual form of the species, and I have seen only a few specimens from North America. It is characterized by having the cups two or three times proliferous, some of the proliferations bearing smaller cups."

WAYNE: King's Woods, Scott Twp. (1942).

47. Cladonia coniocraea (Floerke) Spreng.

BERKS: Woods near Pulpit Rocks (*N. L. Britton*, no date, NY.). HUNTINGDON: Nature Camp (*Thomson*, 1937). LACKAWANNA: Moscow (*Nearing*, 1939). MONTGOMERY: Ogontz (*Geo. B. Kaiser*, 1910, P.). PHILADELPHIA: Wissahickon Creek (*Kaiser*, 1921, SMS.). PIKE: Blakeslee (*Torrey*, 1936).

47a. Cladonia coniocraea f. ceratodes (Floerke) Dalla Torre & Sarnth.

BERKS: Monterey (*Mrs. E. C. White*, 1936, SI.). BRADFORD: Burlington, Cedar Ledge, and Armenia Mt. (*Nearing*, 1939). BUCKS: Morrisville (1939). HUNTINGDON: Nature Camp (*Thomson*, 1937). LANCASTER: Wrightsdale (*Nearing*, 1940). LEHIGH: Blue Mt. (*Torrey*, 1933). LUZERNE: Pike's Creek (*Nearing*, 1939). LYCOMING: Ellenton (*Nearing*, 1939), Hepburnville (1941). MONROE: Scotrun (*Nearing*, 1939), Pocono Mts. (*Dillman*, 1934), Poconos (*Evans*, 1941). PIKE: Shohola Falls and Lake Wallenpaupack (*Torrey*, 1937), Bushkill Falls (*Thomson*, 1940, and *Nearing*, 1941). SULLIVAN: Bernice and Whirl's End (*Nearing*, 1939). TIOGA: Liberty (*Torrey*, 1937), Harrison State Park (*Nearing*, 1939). WAYNE: Shehawken (1940). Galilee (*Nearing*, 1939). WYOMING: Nicholson (1941). YORK: Bryansville (*Nearing*, 1940).

47b. Cladonia coniocraea f. truncata (Floerke) Dalla Torre & Sarnth.

The podetia in this form have blunt tips, frequently forming small cups.

BERKS: Monterey (*Mrs. E. C. White*. 1936. SI.). BRADFORD: Cedar Ledge (*Nearing*. 1939). BUCKS: Morrisville (1939). HUNTINGDON: Nature Camp (*Thomson*, 1937). LEHIGH: Blue Mt. (*Torrey*, 1933). LUZERNE: Pike's Creek (*Nearing*, 1939). LYCOMING: Hepburnville (1941). MIFFLIN: Maitland (1941). MONROE: Lake Lenape, Pocono Mts. (*Dillman*, 1934), Poconos (*Evans*, 1941). PIKE: Bushkill Falls (*Thomson*, 1940).

SULLIVAN: Forksville and Whirl's End (*Nearing*, 1939). TIOGA: Harrison State Park (*Nearing*, 1939). WAYNE: Shehawken and South Sterling (1940). WYOMING: Nicholson (1941).

47c. Cladonia coniocraea f. pycnotheliza (Nyl.) Vainio

This form is characterized by an unusual abundance of apothecia. They may be either sessile or stalked, on the primary squamules, or stalked at the summit or along the sides of the podetia.

BRADFORD: Armenia Mt. (*Nearing*, 1939). CENTER: Bear Meadows (*Thomson*, 1937). HUNTINGDON: Nature Camp (*Thomson*, 1937). LYCOMING: Hepburnville (1941). MONROE: Lake Lenape, Pocono Mts. (*George F. Dillman*, 1934), Blakeslee (*Torrey*, 1936), Poconos (*Evans*, 1941). WAYNE: Galilee (*Nearing*, 1939), Shehawken (1940).

47d. Cladonia coniocraea f. stenoscypha (Stuckenberg) Sandst.

In f. *stenoscypha* the podetia are narrow, ecorticate, and have slender cups.

LEBANON: Mt. Gretna (1941). LUZERNE: Pike's Creek (*Nearing*, 1939). WYOMING: Nicholson (1941).

47e. Cladonia coniocraea f. robustior (Harm.) Sandst.

Similar to f. *ceratodes*, but stouter, often with a diameter of 2.5-3 mm. in the middle of the podetia.

PIKE: Bushkill Falls (*Nearing*, 1940).

47f. Cladonia coniocraea f. phyllostrota (Floerke) Vainio

A form marked by the presence of podetial squamules.

LYCOMING: Hepburnville (1941).

48a. Cladonia borbonica f. cylindrica Evans

The usual form in Pennsylvania, and characterized by esquamulose podetia, often sharp-pointed, cupless or with narrow cups.

BUCKS: Morrisville (1939). BRADFORD: Armenia Mt. (*Nearing*, 1939). CHESTER: Nottingham (*Nearing*, 1940). DAUPHIN: Deodate (1941). LANCASTER: Wrightsdale (*Nearing*, 1940). LUZERNE: Pike's Creek (*Nearing*, 1939). MIFFLIN: Maitland (1941). MONROE: Scotrun (*Nearing*, 1939), Water Gap and Poconos (*Evans*, 1941). NORTHUMBERLAND: Turbotville (1941). PIKE: Bushkill Falls (1941), Lake Wallenpaupack and Shohola Falls (*Torrey*, 1937). SULLIVAN: Bernice (*Nearing*, 1939). SUSQUEHANNA: Starrucca Depot (1941). WAYNE: Shehawken (1940), Galilee (*Nearing*, 1939).

49a. Cladonia pityrea var. Zwackhii Vainio

Characterized by its relatively short podetia. The only variety found here.

BERKS: Wernersville (*Mary E. Williams*, 1906, SMS., det. Mary F. Miller; species only on label). SCHUYLKILL: Zion's Grove (1941). WAYNE: Shehawken (1939).

49aa. Cladonia pityrea var. Zwackhii f. subacuta Vainio

If sterile, the podetia may be simple or irregularly branched, with gradually tapering branches. If fertile, the podetia are usually simple.

HUNTINGDON: Nature Camp (*Thomson*, 1939). LACKAWANNA: Moscow (*Nearing*, 1939). LUZERNE: Pike's Creek (*Nearing*, 1939). MIFFLIN: Maitland (1941). MONROE: Poconos (*Evans*, 1941), Scotrun (*Nearing*, 1939). PIKE: Bushkill Falls (1941). WAYNE: Scott Center (1941).

49ab. Cladonia pityrea var. Zwackhii f. squamulifera Vainio

A form with abundant squamules on the podetia.

HUNTINGDON: Nature Camp (*Thomson*, 1939). MONROE: Pocono Lake (*Mrs. D. Stifler*, 1935). TIOGA: Harrison State Park (*Nearing*, 1939). WAYNE: Galilee (*Nearing*, 1939), and Lakewood (1941).

49ac. Cladonia pityrea var. Zwackhii f. epiphylla Sandst.

This form has short cupless podetia, with branches usually tipped with apothecia, and is corticate throughout, and generally without soredia.

LUZERNE: Pike's Creek (*Nearing*, 1939).

49ad. Cladonia pityrea var. Zwackhii f. phyllophora Sandst.

A form with indistinct cups, and squamules on podetia.

WAYNE: Lakewood (1942).

Group 3. Foliosae

50. Cladonia strepsilis (Ach.) Vainio

WAYNE: Shehawken (1940).

50a. Cladonia strepsilis f. coralloidea (Ach.) Vainio

This form is esorediose and squamulose.

LANCASTER: Wakefield (*Nearing*, 1940). MONROE: Poconos (*Evans*, 1941).

50b. Cladonia strepsilis f. glabrata Vainio

Podetia without soredia, and squamulose.

HUNTINGDON: Nature Camp (*Thomson*, 1938).

Group 4. Ochrochlorae

51a. Cladonia piedmontensis f. obconica Robbins

The podetia in this form are obconical, bear large apothecia, and are without squamules, or only a few basally.

LANCASTER: Wakefield (*Nearing*, 1939).

51b. Cladonia piedmontensis f. squamulosa Robbins

This form has a tendency toward bearing large squamules throughout.

CHESTER: Nottingham (*Nearing*, 1940).

51c. Cladonia piedmontensis f. lepidifera (Vainio) Robbins

The podetia are cylindrical, much-branched, and bear many small apothecia.

YORK: Delta (*Nearing*, 1940).

This catalog represents collections from 54 of the 67 counties of Pennsylvania. Eight of the counties are represented by a collection of over 20 species, in the following order: Wayne 46, Monroe 36, Pike 34, Huntingdon, Bradford, and Chester 28 each, Lancaster 21, and Sullivan 20. The total number of collections listed is 1040 odd specimens. This catalog includes 51 species, with about 130 varieties and forms, of *Cladonia* in Pennsylvania.

From the standpoint of number of collections, *Cladonia cristatella*, with 122 separate records in the state, is the commonest species. The rarest, based again on the number of collections, are as follows: *C. coccifera* (1 doubtful specimen), *C. mitis* 1, *C. calycantha* 1, *C. major* 1, *C. cariosa* 2, *C. floridana* 2, *C. alpestris* 2, *C. piedmontensis* and *C. deformis* 3 each, *C. cenotea*, *C. degenerans*, 4 each, *C. digitata* 5, and *C. didyma* and *C. turgida* 6 each. Most of these rarer species find in Pennsylvania either their northern or their southern limit.

Program of Meetings during 1942

Date	*Subject*	*Speaker*	*Attendance*
Jan. 22	Plant Colonization Problems on Anthracite Waste Heaps	J. R. Schramm	17
Feb. 26	Camera Adventures with New Jersey Pine Barren Plants	John Gill	54
Mar. 26	A Botanist's Experiences in Kashmir	Robert R. Stewart	25
Apr. 25	Plant Collecting along a Mexican Highway	Mrs. Ida K. Langman	22
May 20	Exploring for Orchids and Air-plants in Tropical America	Mulford B. Foster	54
Sept. 24	Reports by Members on Summer Work		9
Oct. 29	A Botanist in the South West	John M. Fogg, Jr.	34
Nov. 19	Plants and Civilization	Elmer D. Merrill	47
Dec. 17	Native Plants in the Field and the Garden	Edgar T. Wherry	27

List of Officers and Members, 1942

FRANCIS W. PENNELL, *President*
HARRY W. TRUDELL, *Vice-President*
RICHARD W. POHL, *Secretary*
LEE SOWDEN, *Treasurer*
BAYARD LONG, *Curator*
FRANCIS W. PENNELL, *Editor of* BARTONIA

ACTIVE MEMBERS

(as of February 1, 1943)

	Elected
J. W. ADAMS, 32 Pleasant St., Germantown, Philadelphia, Pa.	1925
MRS. A. C. BARNES, Latch's Lane, Merion, Pa.	1942
EDWIN B. BARTRAM, Bushkill, Pa.	1906
J. RUSSEL BEBLER, 135 E. Phil Ellena St., Germantown, Philadelphia, Pa.	1919
DR. WALTER M. BENNER, 5636 Loretta Ave., Frankford, Philadelphia, Pa.	1912
JASPER T. BENTLEY, 7334 Rural Lane, Mt. Airy, Philadelphia, Pa.	1933

Carl E. Bliss, 76 N. Grove St., East Aurora, N. Y.	1924
Carl Boyer, Wagner Institute, 17th St. & Montgomery Ave., Philadelphia, Pa.	1926
Miss Ethel Brubaker, " The Fairfax ", 43rd & Locust Sts., Philadelphia, Pa.	1939
Lloyd G. Carr, Dept. of Botany, University of Pennsylvania, Philadelphia, Pa.	1942
Miss Marie Chillas, 233 Winona Ave., Germantown, Philadelphia, Pa.	1941
Richard B. Chillas, 233 Winona Ave., Germantown, Philadelphia, Pa.	1942
Prof. M. A. Chrysler, Rutgers University, New Brunswick, N. J.	1931
F. Van Buren Connell, 443 Berkley Road, Haverford, Pa.	1924
Palmer DePue, 4209 Longshore St., Tacony, Philadelphia, Pa.	1939
W. H. Dix, 801 Crown St., Morrisville, Pa.	1942
Robert T. Dreisbach, 301 Helen St., Midland, Mich.	1922
Leonard J. Duersmith, 511 Walnut St., Columbia, Pa.	1931
Miss Elizabeth C. Earle, 4209 Chester Ave., Philadelphia, Pa.	1935
Howard W. Elkinton, 6514 Germantown Ave., Philadelphia, Pa.	1931
Mrs. Harold Evans, " Awbury ", E. Washington Lane, Germantown, Philadelphia, Pa.	1931
Richard Blossom Farley, " Sarobia ", Eddington, Pa.	1931
Dean John M. Fogg, Jr., College Hall, University of Pennsylvania, Philadelphia, Pa.	1921
Fairman R. Furness, Media, Pa.	1935
John Gill, Haddon Farms, Haddonfield, N. J.	1939
Dr. Robert B. Gordon, State Teachers College, West Chester, Pa.	1942
Louis E. Hand, 8061 Fairview St., Holmesburg, Philadelphia, Pa.	1936
Arthur M. Henry, 416 New Post Office, Atlanta, Ga.	1927
Howard K. Henry, 1464 Grayton St., Penn Wynne, Pa.	1932
Mrs. J. Norman Henry, Gladwyne, Pa.	1932
Miss Josephine de Norman Henry, Gladwyne, Pa.	1938
Miss L. K. Herring, 444 Queen Lane, Germantown, Philadelphia, Pa.	1942
F. F. Huber, Pennsburg, Pa.	1911
Mrs. Arnold S. Hyatt, Andover, Conn.	1938
Lee P. Hynes, Haddonfield, N. J.	1939
Miss Nancy E. James, 4043 Baltimore Ave., Philadelphia, Pa.	1942
Charles F. Jenkins, Kitchens Lane, Mt. Airy, Philadelphia, Pa.	1934
Miss Clara Kast, 2004 Spring Garden St., Philadelphia, Pa.	1932
Miss Natalie B. Kimber, 538 E. Locust Ave., Germantown, Philadelphia, Pa.	1928
Rev. William U. Kistler, 118 Main St., Pennsburg, Pa.	1911
Prof. W. A. Kline, Ursinus College, Collegeville, Pa.	1911
Charles E. Knopf, 7161 Georgian Road, Philadelphia, Pa.	1931
Ray Kriner, 419 Hershey Community Bldg., Hershey, Pa.	1939
Dr. Henry A. Laessle, 5900 Market St., Philadelphia, Pa.	1894
Mrs. Ida K. Langman, 2316 Delancy St., Philadelphia, Pa.	1937
Morris E. Leeds, 1025 Westview St., Mt. Airy, Philadelphia, Pa.	Founder
Dr. Harry A. Lloyd, 200 N. 35th St., Philadelphia, Pa.	1931
Bayard Long, 250 Ashbourne Road, Elkins Park, Pa.	1906
Ernest H. Ludwig, Walter Reed General Hospital, Washington, D. C.	1938
Adolph Müller, Box 66, Norristown, Pa.	1920
Mrs. George B. Orr, " Orchard Way ", Berwyn, Pa.	1935
Dr. Samuel C. Palmer, Swarthmore College, Swarthmore, Pa.	1929
Dr. Ruth Patrick, Academy of Natural Sciences, Philadelphia, Pa.	1937
Dr. Francis W. Pennell, Moylan, Pa.	1910
Richard W. Pohl, 8407 Kenyon Ave., Wauwatosa, Wis.	1940
Harold W. Pretz, 123 S. 17th St., Allentown, Pa.	1909
Mrs. Karl Rugart, 612 Bryn Mawr Ave., Penn Valley, Pa.	1942

Robert L. Schaeffer, Jr., Dept. of Botany, Univ. of Pennsylvania, Philadelphia, Pa.	1938
Dr. J. R. Schramm, Dept. of Botany, University of Pennsylvania, Philadelphia, Pa.	1937
Miss Helen B. Shriver, 2004 Spring Garden St., Philadelphia, Pa.	1935
Henry Skinner, Morris Arboretum, Chestnut Hill, Pa.	1942
Lee Sowden, 3823 Oak Road, Germantown, Philadelphia, Pa.	1901
Dr. Walter Steckbeck, Dept. of Botany, University of Pennsylvania, Philadelphia, Pa.	1925
Hugh E. Stone, 431 Berkley Road, Haverford, Pa.	1892
J. Fletcher Street, 1120 Locust St., Philadelphia, Pa.	1918
Dr. Robert R. Tatnall, 1100 W. Tenth St., Wilmington, Del.	1928
Horace E. Thompson, 5016 Schuyler St., Germantown, Philadelphia, Pa.	1920
Wm. M. Thompson, Jr., Leroy Court Apts. #403, 1700 S. 60th St., Philadelphia, Pa.	1936
R. J. Titherington, 6317 N. Norwood St., Philadelphia, Pa.	1942
Harry W. Trudell, 303 Highland Ave., Abington, Pa.	1915
Miss Helen Vrooman, Ashbridge Road, Rosemont, Pa.	1942
Dr. Paul R. Wagner, Ursinus College, Collegeville, Pa.	1935
Warren H. Wagner, 7708 N.W. Morningside Drive, Washington, D. C.	1942
E. Perot Walker, 511 Lynmere Road, Bryn Mawr, Pa.	1939
Mrs. Marguerite L. Warnke, 142 S. Logan Ave., Audubon, N. J.	1935
Robert F. Welsh, 325 Chestnut St., Philadelphia, Pa.	1909
Dr. L. C. Wheeler, Dept. of Botany, University of Pennsylvania, Philadelphia, Pa.	1942
Dr. Edgar T. Wherry, Dept. of Botany, University of Pennsylvania, Philadelphia, Pa.	1925
Hans Wilkens, 424 S. 15th St., Reading, Pa.	1942
William H. Witte, Riegelsville, Pa., R. D.	1898
Carroll E. Wood, Jr., Dept. of Botany, University of Pennsylvania, Philadelphia, Pa.	1942
Miss Mary F. Wright, 538 Locust Ave., Germantown, Philadelphia, Pa.	1928

HONORARY MEMBERS

Samuel N. Baxter, Morris & Abbotsford Sts., Germantown, Philadelphia, Pa.	1918
Dr. Joseph S. Illick, State College of Forestry, Syracuse, N. Y.	1925
Edward Pennock, 243 Harvey St., Philadelphia, Pa.	Founder
Dr. Edward E. Wildman, 4331 Osage Ave., Philadelphia, Pa.	1931

CORRESPONDING MEMBERS

Dr. John H. Barnhart, New York Botanical Garden, New York, N. Y.	1936
Otway H. Brown, Cape May, N. J., R. F. D. #1	1908
Stewart H. Burnham, Cornell University, Ithaca, N. Y.	1911
Prof. M. L. Fernald, Gray Herbarium, Harvard University, Cambridge, Mass.	1929
Dr. A. Arthur Heller, Chico, Calif.	1893
Dr. Harold St. John, University of Hawaii, Honolulu, T. H.	1927
Dr. William Randolph Taylor, University of Michigan, Ann Arbor, Mich.	1921
Dr. Campbell E. Waters, Washington, D. C.	1904
Dr. Heber W. Youngken, Massachusetts College of Pharmacy, Boston, Mass.	1918

Index to Species

(Also includes in **bold-face** type names of new forms.)

Aegilops cylindrica, 5

Carex mesochorea, 4

Cladonia acuminata, 36, 52; alpestris, 37, 38, 39, 62; apodocarpa, 35, 37, 49; bacillaris, 36, 40; borbonica, 36, 60; caespiticia, 37, 49; calycantha, 36, 54, 62; cariosa, 38, 52, 62; caroliniana, 35, 37, 44; cenotea, 35, 49, 62; chlorophaea, 34, 35, 55; clavulifera, 35, 38, 51; coccifera, 36, 41, 62; coniocraea, 34, 36, 37, 59; conista, 34, 35, 57; cristatella, 34, 37, 42, 62; cryptochlorophaea, 56; deformis, 35, 42, 62; degenerans, 36, 54, 62; delicata, 36, 49; didyma, 34, 36, 41, 62; digitata, 35, 42, 62; fimbriata, 34, 35, 57; floerkeana, 36, 40; floridana, 37, 47, 62; furcata, 34, 35, 37, 45; gracilis, 34, 35, 36, 52; grayi, 34, 35, 56; g., f. **carneopallida,** 57; incrassata, 36, 44; i., f. **aurantiaca,** 44; macilenta, 36, 40; major, 35, 58, 62; mateocyatha, 36, 54; mitis, 37, 38, 39, 62; mitrula, 34, 37, 50; multiformis, 34, 36, 47; nemoxyna, 34, 35, 37, 58; ochrochlora, 36, 37, 58; papillaria, 35, 37, 39; piedmontensis, 38, 61, 62; pityrea, 35, 36, 60; pleurota, 35, 41; pyxidata, 34, 36, 54; rangiferina, 37, 38; scabriuscula, 34, 35, 36, 46; silvatica, 37, 38; squamosa, 34, 36, 37, 47; strepsilis, 35, 38, 61; subcariosa, 35, 38, 51; symphicarpa, 52; tenuis, 37, 38, 39; turgida, 34, 35, 37, 49, 62; uncialis, 35, 37, 44; verticillata, 34, 35, 36, 53

Cuscuta campestris, 4

Euphorbia serpyllifolia, 5

Juncus effusus pylaei, 4

Panicum tsugetorum, 3

Phlox floridana, 1; g., f. **bella,** 2

Plantago indica, 4

Poa palustris, 3

Quercus *cinerea,* 3; incana, 3

Index to Persons Considered

(In account of Philadelphia Botanical Collectors)

Abbott, Millie, 23; Abbott, W. L., 29; Adams, J. W., 30; Alsop, Samuel, 27; Apgar, A. C., 15; Austin, C. F., 12

Bachman, C. C., 27; Bartram, E. B., 27; Bassett, F. L., 25; Bassett, G. W., 25; Beaver, D. B. D., 18; Beitel, C. F., 27; Benner, W. M., 29; Beringer, G. M., 20; Berkheimer, David, 30; Bilgram, Hugo, 17; Bischoff, G., 22; Boyer, C. S., 19; Brinton, J. B., 14; Britton, N. L., 20; Brown, O. H., 26; Brown, Stewardson, 22, 23; Browne, C. H., 15; Brubaker, Ethel, 30; Brumbach, W. G., 30; Burk, Isaac, 11

Canby, W. M., 13, 27; Carter, J. J., 17, 23; Commons, Albert, 13; Conard, H. S., 26, 27; Crawford, Joseph, 20, 23

Darlington, William, 27; Dautun, Henry, 19; Diffenbaugh, Elias, 22; Dowell, Philip, 27; Dreisbach, R. R., 29

Eby, A. F., 12; Eckfeldt, J. W., 18; Ellis, J. B., 13; Everhart, B. M., 11

Febiger, Christian, 11; Fender, F. S., 29; Fisher, H. L., 20; Fogg, J. M., 29; Fosberg, F. R., 30; Fothergill, Ann, 27; Fretz, C. D., 17, 23

Garber, A. P., 15; Githens, T. S., 23; Grass, E. M., 26; Gross, C. A., 22; Grove, J. H., 19; Gruber, C. L., 21

Haines, A. S., 27; Hamm, D. W., 27; Hand, L. E., 31; Harshberger, J. W., 23, 24; Heller, A. A., 22; Herbst, William, 14, 23, 27; Heritage, Benjamin, 14, 23; Hermann, F. J., 30; Hoopes, Benjamin, 27; Hoopes, Josiah, 14

Jackson, Halliday, 11; Jahn, Albrecht, 23; Jellett, E. C., 23

Kain, C. H., 18; Kaiser, G. B., 15; Kauffman, C. H., 24; Keller, I. A., 21, 23; Krout, A. F. K., 15, 16, 23, 27

Lang, H. A., 19; Larsen, E. L., 29; LaWall, C. H., 25; Leeds, A. N., 23, 25; Leeds, M. E., 23, 25; Leibelsperger, W. H., 26; Leidy, Joseph, 12; Leonard, E. C., 29; Lippincott, C. D., 16, 23; Lochman, C. N., 27; Long, Bayard, 28; Lowe, J. D., 15

MacElwee, Alexander, 23, 24; Macfarlane, J. M., 19; Mackenzie, K. K., 26; Marot, Philip, 23; Martin, George, 13; Martindale, I. C., 16; Meehan, Thomas, 13, 23; Meredith, H. B., 19; Moyer, I. S., 15, 17; Murphy, A. R., 15

Nearing, G. G., 30

Oberlin, T. J., 18; Otis, J. P., 17

Painter, J. H., 27; Palmer, T. C., 17, 20; Palmer, Walter, 20; Parker, C. F., 12, 16; Patrick, Ruth, 30; Pennell, F. W., 28; Pennock, Aldrich, 23; Peters, J. E., 18; Porter, T. C., 12, 27; Poyser, W. A., 27; Pretz, H. W., 26; Price, F. W., 23

Rau, E. A., 17, 27; Redfield, J. H., 10; Redles, George, 23; Reece, Davis, 27; Rex, George, 17; Rhoads, J. R., 13; Rothrock, J. T., 15; Ruth, H. F., 21; Ruth, J. A., 21

Saunders, C. F., 20, 23; Schaeffer, Charles, 23; Schaeffer, R. L., 30; Scribner, F. L., 18; Small, J. K., 24; Smith, B. H., 16, 23; Smith, C. E., 12; Smith, U. C., 16, 23; Steere, W. C., 30; Stevenson, W. C., 17; Stokes, Joseph, 23; Stone, H. E., 25; Stone, Witmer, 21, 23

Tanger, L. F. A., 30; Tatnall, Edward, 11, 23, 27; Tatnall, R. R., 25; Taylor, Norman, 27; Taylor, W. R., 29; Tees, G. M., 30; Tenbrook, E. L., 23; Terrell, E. E., 27; Travis, M. T., 30; Trimble, G. M., 27; Trimble, Henry, 17; Trimble, Samuel, 17, 23; Trimble, William, 17, 23; True, R. H., 22

Van Pelt, S. S., 21, 23

Ware, C. S., 23; Wherry, E. T., 28; Wilkens, Hans, 30; Williams, Newlin, 23; Williamson, C. S., 19, 23; Willmarth, H. M., 18; Wingate, Harold, 19; Wismer, Virginia, 15; Witte, W. H., 21, 26; Wolle, Francis, 11; Wood, H. C., 16; Woolman, Lewis, 16

York, H. H., 26

No. 23 ✓ 1944-1945

BARTONIA

PROCEEDINGS OF THE
PHILADELPHIA BOTANICAL CLUB

CONTENTS

The Phlox carolina Complex .... EDGAR T. WHERRY 1

In Defense of the Validity of William Bartram's Binomials ...... E. D. MERRILL 10

Notes on North American Campanulaceae .... ROGERS MCVAUGH 36

Will the Stowaway, *Molinia caerulea*, become Naturalized? .... W. L. DIX 41

How Durand acquired Rafinesque's Herbarium .... FRANCIS W. PENNELL 43

Franklin and Marshall College Herbarium at Lancaster, Pennsylvania H. K. GROFF 47

Notes 49

Program of Meetings during 1943 and 1944 54

List of Officers and Members, 1943-1945 54

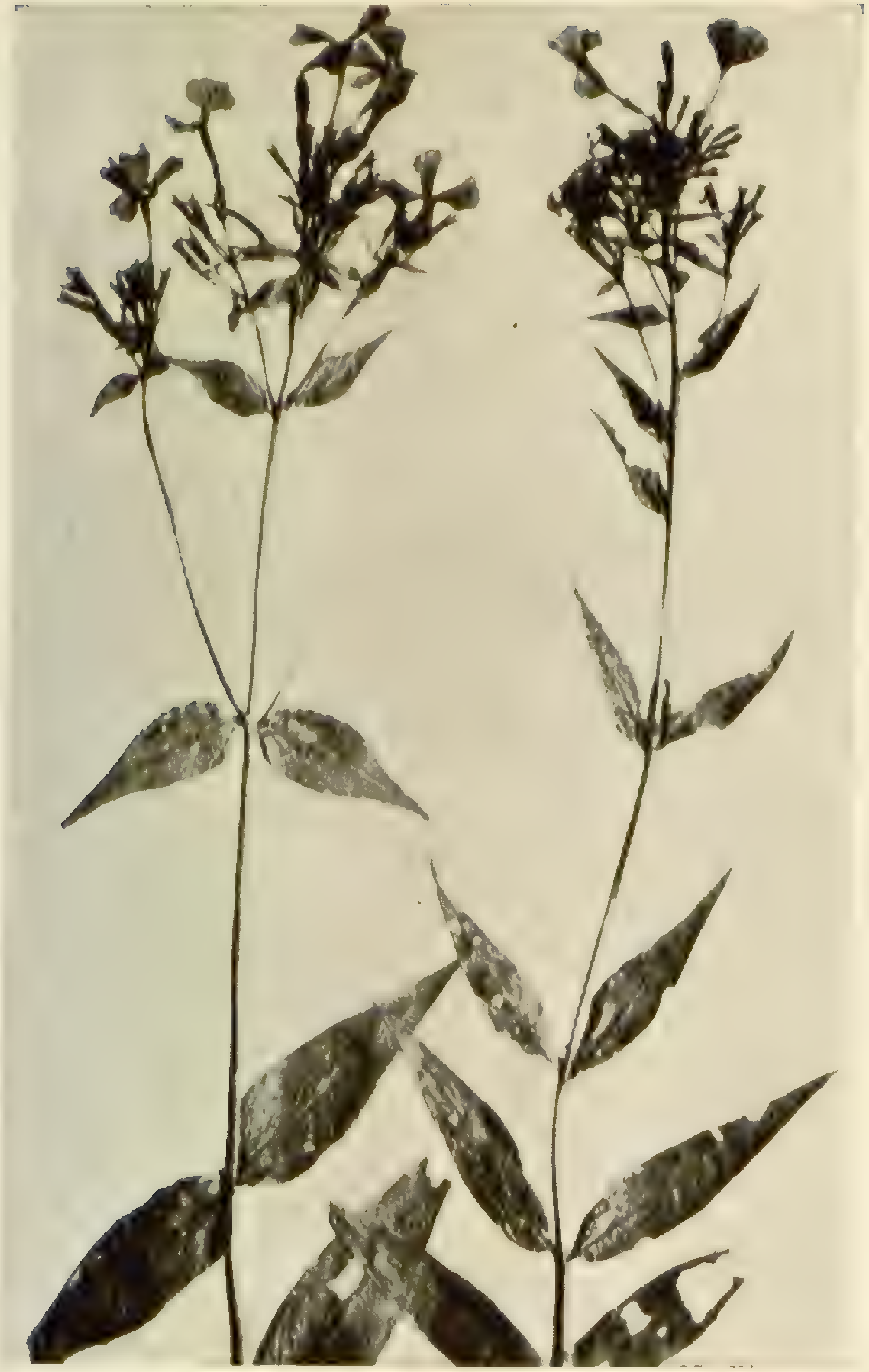
Index to Species 58

Index to Persons Considered 60

PUBLISHED BY THE CLUB
ACADEMY OF NATURAL SCIENCES, NINETEENTH AND THE PARKWAY,
PHILADELPHIA
ISSUED NOVEMBER 23, 1945

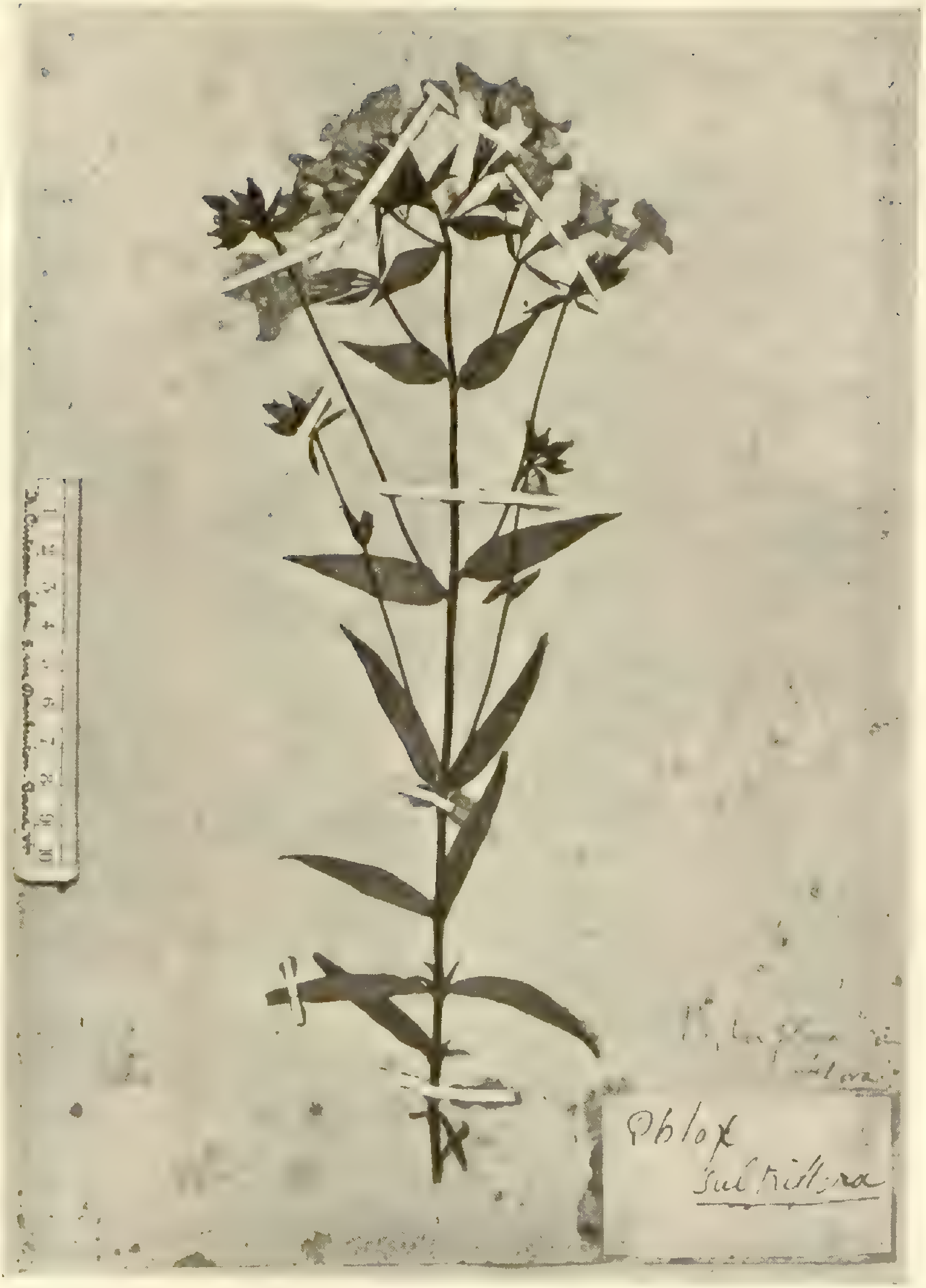
MISSOURI BOTANICAL GARDEN LIBRARY
DEC 10 1945

PLATE 1



Phlox carolina L.

Type specimen in Linnaean herbarium
(Courtesy of Dr. Wm. R. Maxon)



Phlox triflora Michaux

Type specimen in Michaux herbarium, Paris
(Courtesy of Mr. Ivar Tidestrom)

BARTONIA

PROCEEDINGS OF THE PHILADELPHIA BOTANICAL CLUB

No. 23 PHILADELPHIA, PA. 1943-1944

The Phlox carolina Complex

EDGAR T. WHERRY

In a series of papers in BARTONIA from 1929 to 1934 the writer discussed the eastern Phloxes, concluding that 15 species could be recognized. Subsequent studies have led to no change in this list, but the subdivision of the species into infra-specific entities now needs some revision. In those papers the primary subdivision of the species was termed the variety. For some years, however, the more progressive taxonomists have taken to using the term subspecies instead. While some rather violent denunciations of the latter term have been published, the arguments against it have been subjective and legalistic rather than objective and scientific. Accordingly, it has been decided to adopt the concept of subspecies for major subdivisions of species.

On the other hand, the plan of merely listing entities of lower rank without assigning them technical epithets is being continued. These minor variants are of special interest to students of evolution, geneticists, ecologists, etc., and to follow rules which may require the use of an inappropriate epithet is likely to result in more confusion than clarity. For example, Bentham mistakenly published the combination *Phlox carolina* γ *puberula* for an entity which was not a bit more puberulent than the original *P. carolina,* but differed therefrom in having shorter inflorescence-branches. When the significance of branch-length is under investigation, it would be ridiculous to have to use the epithet *puberula* for the short-branched variant.

The most extensive changes from former usage are called for in connection with *Phlox carolina* L. The treatment of its history presented in the writer's previous discussion was not as full as now seems desirable, so it is here expanded. The entity was first noted by Martyn[1] in 1728 with the characterization: "Lychnidea Caroliniana, Floribus quasi umbellatim dispositis; foliis lucidis crassis, acutis." His plate shows the upper part of a flowering stalk, with oblong-lanceolate leaves and long panicle-branches. The geographic designation indicates that the plant had been sent to England by Catesby, who was in South Carolina from 1722 to 1725.

---

[1] Hist. Plant. Rar.; 10, pl. 10, 1728; ed. 2: 4, pl. 9, 1752. What was probably the same species was figured by Dillenius, Hort. Eltham. 1: 205, pl. 166, f. 203, 1732.

In 1745, after he had returned to England, Catesby wrote to Linnaeus[2] that he had arranged for a Dr. Lawson to send over some American plants which he deemed worthy of cultivation in Linnaeus' garden. Included in the list was a "Lychnidea flore purpureo," presumably the species under discussion.

The generic term *Lychnidea* was in Linnaeus' Species Plantarum[3] replaced by *Phlox.* In the original edition of this work, however, he failed to include the Catesby-Martyn plant. This was classed as a *Phlox* by Miller[4] in 1759, but he did not publish a binomial. He noted, however, that it appears a fortnight later than another species, which was said to bloom in June.

His attention being called to this *Phlox* by Miller's reference to it, Linnaeus evidently pressed two specimens from his garden, where the material sent by Dr. Lawson had grown, and added the sheet to his herbarium, as noted by Jackson,[5] subsequent to 1755. Then in the second edition of the Species Plantarum[6] he proposed for it the epithet *carolina*, with the following description:

> "PHLOX foliis lanceolatis laevibus, caule scabro, corymbis subfastigiatis. [then followed quotations from Miller and Martyn] *Similis Ph. glaberrimae, sed* Caulis *triplo altior, nonnihil scaber.* Folia *latiora, ex ovato-lanceolata.* Corymbus *floribus numerosis, pluribus pedunculis ex alis supremis foliorum, erectis, quasi in corymbum fastigiatis.* Corollarum *tubus laevis est.*"

Some subsequent workers have reduced the Linnaean epithet to synonymy with *P. glaberrima* L., which had been named in the first edition of the Species Plantarum, while others have not only accepted it as valid, but have also proposed additional epithets for closely related entities. The present writer favors the recognition of *P. carolina* as an independent species, and the assignment of relatives to infra-specific status under it. The original representative may be known as:

Phlox carolina typica Wherry, nom. nov.

Stem scabrous, about 75 cm. tall; nodes remote; leaves changing gradually in outline from one node to the next, dominantly oblong-lanceolate, their maximum dimensions, shown few nodes below the inflorescence, 75 and 25 mm.; sepals (8) 9 to 11 mm. long, united over half their length to a cylindric sub-urceolate tube, the junction-membranes narrow and inconspicuous; summer-blooming.

---

[2] Select. Corresp. Linn., by J. E. Smith 2: 440, 1821.

[3] Species Plantarum: 151, 1753.

[4] Gard. Dict., ed. 7: PHL col. 7, No. 2, 1759.

[5] Ind. Linn. Herb., Suppl. Proc. Linn. Soc. 124: 116, 1912. A photograph of the type sheet showing the two specimens, which was kindly obtained for me in 1928 by Dr. William R. Maxon, is reproduced herewith (Plate 1).

[6] Species Plantarum, ed. 2. 1: 216, 1762.

Synonyms: *P. ovata* var. *elatior* Gray;[7] *P. ovata* tall form Gray.[8]

Superfluous epithets: *P. caroliniana* Hill.[9] The drawing illustrating this epithet represents the compact-inflorescence form of the plant.

P. carnea Loddiges,[10] not *P. carnea* Sims; [11] *P. carolina* Sweet.[12] This differed in the leaves being scabrous and in blooming in autumn. Loddiges gave its source as "banks of the Missouri." This indicates that he had obtained it from Nuttall, but had guessed as to its native place; for Fraser's catalog of 1813 included a number of Nuttall's plants collected "principally on the River Missourie." Actually, no *Phlox* was listed in that catalog, and this one was no doubt obtained by Nuttall on his second southern trip in 1816, when he reached the Carolinas. Sweet attributed the plant to Nuttall without giving any locality.

P. coldryana Hort. ex Paxton,[3] alleged to be a hybrid, of unspecified parentage. This large-leaved and -flowered form is best classed as a horticultural variety.

P. carolina γ *puberula* Bentham,[14] based on *P. carolina* Sims.[15] In spite of Linnaeus having defined the original *P. carolina* as having "caule scabro," Bentham placed in this greek-letter category the plant figured by Sims and stated to have the stem "rough with stiff, short, white hairs." Actually the Sims plant does not differ from the original in any significant respect.

Distribution: The original plant and some of its variants came from unspecified points in South Carolina, probably in the Piedmont physiographic province. Chapman distributed specimens of it from "Georgia." The writer has found it in that region but only rarely; cultivation, overgrazing, and overburning have largely destroyed such plants there. It seems to be no longer in cultivation or at least not in the horticultural trade.

The series of entities regarded as separate subspecies will now be taken up in the chronological order of their original announcement.

Phlox carolina altissima (Moench) Wherry, stat. nov.

The epithet *altissima* was originally published as a substitute for *P. carolina* L., and so was superfluous; but the description accompanying it indicated a different entity to be represented. When in 1932 the writer needed an infraspecific epithet for the common Appalachian plant, he took up Moench's in varietal status, because the description fits reasonably well: in cultivation the stature had become "orgyali" or about 180 cm. tall, and in nature 125 to 150 cm.

---

[7] Proc. Amer. Acad. Arts Sci. 8: 249, 1870. Only epithets based as is this on the same type specimen or original description of an entity are regarded as true synonyms.

[8] Syn. Fl. N. A. 2(1): 130, 1878. By this time Gray had recognized the undesirability of assigning technical epithets to minor variants.

[9] Veg. Syst. 8: 32, pl. 31, fig. 4, 1773.

[10] Bot. Cab. 8: pl. 711, 1823.

[11] Curt. Bot. Mag. 47: pl. 2155, 1820.

[12] Brit. Fl. Gard. 2: pl. 190, 1827.

[13] Mag. Bot. 7: pl. 197, 1840; *P.* "*caldriana* Courtois ex Steudel, Nomenclator, ed. 2. 2: 322, 1841; *P.* "*oldryana*" Walpers, Repertorium 6: 526, 1847.

[14] In DC. Prodr. 9: 304, 1845.

[15] Curt. Bot. Mag. 33: pl. 1344, 1810.

is sometimes shown by the mountain plant (whereas other representatives of *P. carolina* are rarely more than half as tall). Moench noted too that the stem was dark at the nodes, and one of the striking field characters of the plant in question is the abundance of anthocyans, causing the stem to be dark-blotched, the leaves especially dark green above, and the corolla intense purple.

From *P. carolina typica* this entity differs in the generally greater stature, more numerous, close-set nodes, larger leaves—up to 100 mm. long and 40 mm. wide—and shorter sepals, their range being 6 to 8 or rarely 8.5 mm. in length. The blooming period extends from midsummer well into autumn.

SYNONYMS: *P. altissima* Moench;[16] *P. carolina* var. *altissima* Wherry.[17]

SUPERFLUOUS EPITHETS: *P. suffruticosa* Ventenat,[18] not Hort. This was proposed in a brief footnote appended to the discussion of other species. Five years later it was more fully described by Willdenow,[19] who is indeed often given as the author of the name. To gain full information as to its features, one has also to refer to its earliest illustration, published by Edwards.[20] It has also been classed as *P. glaberrima* var. *suffruticosa* Gray.[21] For some reason this one of the many names applied to members of the *Phlox carolina* complex has appealed most strongly to horticulturists, and is in general use not only for various of its subspecies, but also for hybrids of it with *P. maculata,* even though scarcely any of the material is really suffruticose or basally shrubby. The plant to which the epithet belongs produces in autumn multiple short sterile shoots with elliptic leaves which persist through the winter. As this is the only recognizable difference from the usual form of the entity here classed as ssp. *altissima,* no segregation seems called for.

Phlox nitida Pursh;[22] *P. carolina β nitida* Bentham;[23] *P. maculata* var. *nitida* Chapman.[24] Except for its lesser stature, recorded by Pursh for cultivated material which may have been stunted, this corresponds exactly to the mountain plant under discussion.

Here should also be mentioned *Phlox carolina* Sweet.[25] Instead of ssp. *typica,* this seems to represent ssp. *altissima,* differing merely in having scabrous leaves. It was included by Brand in the aggregate he termed *P. carnea,* though not the same as the plant to which that name was originally applied.

DISTRIBUTION: This subspecies is the widespread representative of *P. carolina* in the southern Appalachians, ranging from northern Alabama and Georgia to Tennessee and North Carolina, in the Blue Ridge, Appalachian Plateau, and adjacent parts of bordering provinces. In the field its dark green herbage and deep purple flowers, produced over a long season, are striking. The stems are usually solitary or in sparse groups, and sterile shoots are rarely developed at flowering time. What proportion of the plants are "suffruticose" and develop short persistent shoots can only be ascertained by winter field work, which has not as yet been practicable.

---

[16] Meth. Pl. Hort. Marburg: 454, 1794.

[17] BARTONIA 13: 36, 1932.

[18] Jard. Malmaison 2: No. 107, footnote, 1804.

[19] Enum. Pl. Hort. Berol.: 200, 1809.

[20] Bot. Reg. 1: pl. 68, 1815.

[21] Syn. Fl. N. A. 2(1): 130, 1878.

[22] Flora Amer. Sept. 2: 730, 1814.

[23] In DC. Prodr. 9: 304, 1845.

[24] Flora S. U. S.: 338, 1860.

[25] Brit. Flower Gard. 2: pl. 190, 1827.

Phlox carolina triflora (Michaux) Wherry, stat. nov.

The description of this entity furnished by Michaux was rather incomplete, but the type specimen[26] shows the following features:

Stem about 35 cm. tall, with few nodes; leaves changing gradually in size and shape from linear to oblong-lanceolate, their maximum dimensions shown near the base of the inflorescence, 50 and 10 mm.; sepals about 10 mm. long, united over half their length to a narrowly campanulate tube, the junction-membranes broad and conspicuous.

The striking difference in calyx-features from the entities previously discussed might lead to its being classified as an independent species, were there not numerous intermediates between them. All of the entities involved are decidedly variable, and the present one, as studied in the field, proves to overlap the others in stature, number of nodes, length of sepals and even conspicuousness of junction-membranes in the calyx, to say nothing of blooming period and abundance of anthocyan in the herbage.

SYNONYMS: *P. triflora* Michaux;[27] *P. glaberrima,* form with lax corymb, Gray;[28] *P. carolina* var. *triflora* Wherry.[29]

SUPERFLUOUS EPITHETS: *P. carnea* Sims.[30] The careful description of the calyx furnished by Sims shows this to belong to the present subspecies, although the plant was 90 cm. tall, with red-maculate stems and maximum leaf-dimensions 60 and 15 mm.; moreover, it was recorded as blooming in England in autumn. It thus showed some approach to ssp. *altissima,* and may indeed have been a hybrid with that. On the other hand, *P. carnea* Morris[31] corresponds closely to the original plant named *triflora* by Michaux. Other uses of the epithet *carnea* are noted elsewhere.

P. revoluta Aikin.[32] So far as can be judged from the brief diagnosis, this differed from the Michaux plant only in having the stem and leaves slightly scabrous. It represented the northeasternmost occurrence of *P. carolina,* in the Maryland piedmont, whence it has long since vanished under the onslaughts of civilization.

P. bridgesii Marnock.[33] A rather tall variant with the leaves subcordate. This epithet should perhaps be classed as a horticultural variety name.

---

[26] For a photograph of this I am indebted to Mr. Ivar Tidestrom. It is reproduced here (Plate 1) to bring out the general similarity of the plant to ssp. *typica.*

[27] Flora Bor.-Amer. 1: 143, 1803.

[28] Proc. Amer. Acad. Arts Sci. 8: 250, 1870.

[29] BARTONIA 13: 36, 1932.

[30] Curt. Bot. Mag. 47: pl. 2155, 1820.

[31] Flora Conspicua: pl. 16, 1825.

[32] Trans. Md. Acad. Sci. Let. 1: 90, 1837.

[33] Hort. Mag. 6: 182, pl. 69, 1842.

Reference must also be made here to the entity to which the epithet *triflora* was applied by Sweet.[34] It had the stem " thickly clothed with a dense woolly pubescence," and maximum leaf-dimensions 65 and 25 mm. As noted in the 1932 paper, pubescent stems occur in various subdivisions of the species.

Another variant which has not received a technical epithet is the narrow-leaved one, noted by the writer in the 1932 article (3). In this the leaves scarcely widen upward, being only narrowly linear-lanceolate at the inflorescence-base. It thus forms a transition between *Phlox carolina* and *P. glaberrima,* and has indeed been mistaken for the latter in recent reports of its rediscovery in Virginia, including one by the writer.[35] Actually every modern collection seen proves to have the long campanulate calyx of *P. carolina triflora.*

DISTRIBUTION of *P. carolina triflora*: This is the most northern of the subspecies, occurring in Georgia and Alabama only at fairly high elevations, and ranging from there, in various physiographic provinces, to Indiana and Maryland. It is also the earliest to bloom, the usually rather light purple corollas beginning to open in late May. The crowns send up in addition to the flowering shoots also sterile ones of similar stature, bearing at the tip a rosette of elliptic leaves. These sterile shoots are usually deciduous, but occasionally one will bend down and take root at a node, the terminal rosette then persisting through the winter and starting off a new clump the following spring. As in the other subspecies tall sterile shoots are less well developed, this forms a useful character for field recognition of the present one. The tissues are also usually poor in anthocyan, so that the leaves are light green.

Phlox carolina heterophylla (Beauvais ex Brand) Wherry, stat. nov.

In keying out the species of *Phlox,* Brand[36] distinguished a *P. ovata,* with the stem glabrous and leaves ovate to elliptic, from a *P. carnea* having the stem pilose and the upper leaves much broader than the lower. His text shows that he included *P. carolina* L. under the former, overlooking Linnaeus' characterization of the stem as scabrous. Though attributing the epithet *carnea* to Sims, Brand on page 65 gave a description not in agreement with the text and plate published by that author. He then listed three illustrations—two representing different forms of *P. carolina typica,* the third *P. maculata*—and added as a synonym *P. heterophylla* P. Beauvais mss. Finally two collections were cited, North Carolina, Gray & Carey, July 1841 (specimens of which in American herbaria are *P. ovata* L.); and Georgia, Rising Fawn, Curtiss 6795 (our own specimens being *P. carolina triflora*).

The simplest way out of this bit of chaos is to ignore the illustrations and specimens cited by Brand, and to use the Beauvais manuscript epithet *heter-*

---

[34] Brit. Flower Gard. 1: pl. 29, 1823.

[35] BARTONIA 16: 42, 1935.

[36] In Engler's Pflanzemreich IV. 250: 55, 1907.

ophylla for the representative of *P. carolina* corresponding to Brand's description as to leaf-characters. Field study shows this to have the features:

Height to 90 cm.; nodes few; lowest leaves linear, those at successive nodes markedly widened, until near the inflorescence their dimensions may reach 75 and 25 mm.; calyx urceolate, 7-9.5 mm. long.

SYNONYMS: *P. heterophylla* Beauvais ex Brand, emend.[37] *P. carolina* var. *heterophylla* Wherry,[38] in large part.

DISTRIBUTION of *P. carolina heterophylla*: This entity apparently centers in northern Alabama, but ranges locally to Mississippi, Georgia, and western Florida, in Plateau and Coastal Plain provinces. It blooms in summer and at that time may bear elongate sterile shoots much like those of ssp. *triflora*, but fewer in number. The stem is usually glabrate, but as noted in the writer's previous paper, there is a soft-hairy variant.

Phlox carolina turritella Wherry, ssp. nova.

Toward the southwestern side of the species range there occurs an entity like the last in some respects, but having more numerous nodes, with the largest leaves at the middle of the stem. In annotating herbarium sheets the writer has in the past labelled such specimens " var.heterophylla," but now proposes to separate them.

The characters of the novelty are:

Height 50 to 100 cm.; nodes numerous, usually 15 to 30, rather crowded; principal leaves elliptic-oblong, the largest at or near the middle of the stem, to 90 mm. long and 20 mm. wide, the upper forming a tapering cone of foliage, to which the epithet refers; sepals 7 to 9 mm. long, united ½ to ⅗ their length to a cylindric sub-urceolate tube, the junction-membranes rather inconspicuous.

Planta 50-100 cm. alta; nodi ca. 15-30, subcongesti; folia majora elliptico-oblonga, medio caule maxima, usque ad 90 mm. longa et 20 mm. lata, apicem versus conum foliorum attenuatum offert; sepala 7-9 mm. longa, in tubo sub-urceolato ½-⅗ longitudinis conjuncta.

TYPE: Open woods 5 miles west of Autaugaville, Autauga County, Alabama (32-27, 86-44), collected by Edgar T. Wherry July 13, 1932, in herbarium Academy Natural Sciences Philadelphia. Known also from Clarke, Henry, and Wilcox counties, Alabama, and as intermediates elsewhere.

Subspecies Intermediates

Intermediates between the recognized subspecies are frequent, one as noted above being apparently the basis for *P. carnea* Sims. Mention should here be made of one collected by Mrs. J. Norman Henry in Meriwether County, Georgia, and cultivated in her garden at Gladwyne, Montgomery County, Pa. This produces short persistent sterile shoots, like those of the *suffruticosa* phase of

---

[37] *Op. cit.*, p. 65; excluding citations and restricting to key-characters.

[38] BARTONIA 13: 36, 1932.

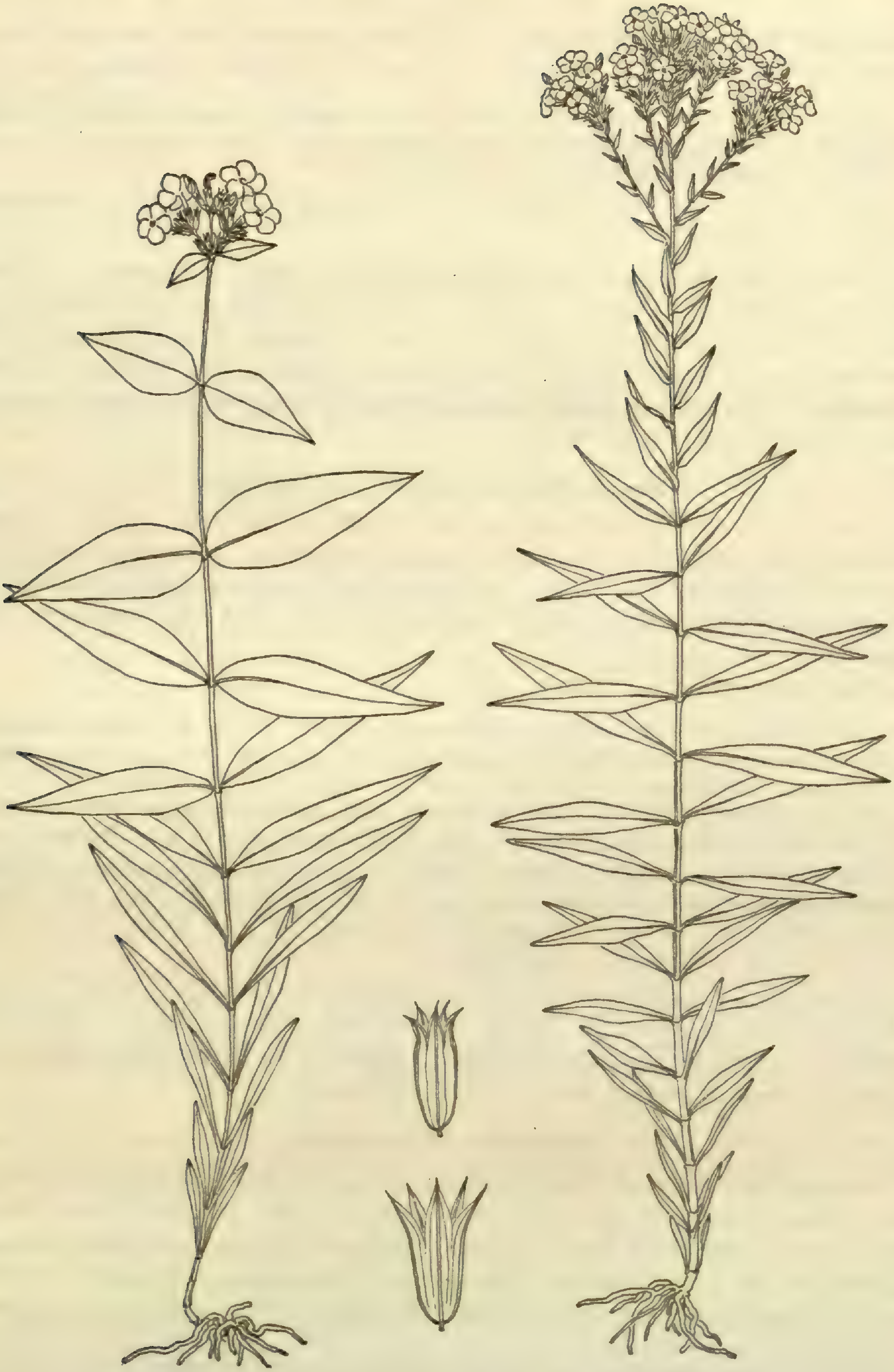


Plate 2. Subspecies of *Phlox carolina.*

At left, *P. carolina heterophylla;* at right, *P. carolina turritella.*

The calyces in the center are twice natural size; the lower one, subcampanulate with conspicuous junction-membranes, represents ssp. *triflora;* the upper, sub-urceolate with obscure membranes, is the type characterizing all the other subspecies.

ssp. *altissima;* as in that, too, its blooming season extends over a long period in summer and autumn. On the other hand, in the arrangement of the leaves and the sepal-length it is more like ssp. *turritella.* The inflorescence is very large, and the corollas have a lovely glowing pink hue, enhanced by the golden anthers in the center. Far superior to any of the so-called suffruticosa Phloxes in cultivation, it is being placed in the horticultural trade under the name *Phlox carolina* " Gloriosa."

PHLOX CAROLINA: KEY TO SUBSPECIES AND RELATIVES

- STEM-NODES only 3-5 (6) below inflorescence; calyx (8) 9-13 mm. long; blooming period late spring to summer; short sterile shoots conspicuous, persistent; uplands, n. Ala. to Ohio and Pa. .... *P. ovata*
- STEM-NODES 6 or more below inflorescence; calyx not over 11 mm. long.
  - ROOTSTOCK stout and short, producing multiple green or moderately red-maculate stems; upper leaves and lower bracts basally cuneate, truncate or exceptionally subcordate; inflorescence more or less corymbose.
    - NODES few, 6-12; largest leaves above mid-stem; late spring to summer.
      - CALYX sub-campanulate, the junction-membranes broad and conspicuous; length (8) 9-11 mm.; nodes sub-uniformly spaced, the leaf-shape changing gradually from one to the next; principal leaves oblong-lanceolate (to linear northeastward); tall sterile shoots well-developed, some becoming decumbent and persistent; Ala. to Ind. & Md., in lowlands only northward... *P. carolina triflora.*
      - CALYX cylindric to sub-urceolate, the junction-membranes narrow, plicate, inconspicuous; upper nodes wide-spaced; sterile shoots few.
        - LEAF-SHAPE changing gradually from node to node, becoming oblong-lanceolate; calyx (8) 9-11 mm. long; foothills, S. C. and Ga. *P. carolina typica.*
        - LEAF-SHAPE changing rapidly from node to node, becoming oblong or ovate; calyx 7-9 (10) mm. long; Miss. to S. C. and s. Tenn. *P. carolina heterophylla.*
    - NODES numerous, 12-25 (30); tall sterile shoots little developed.
      - PRINCIPAL LEAVES oblong-lanceolate, crowded or moderately spaced; persistent short sterile shoots sometimes well-developed.
        - LARGEST LEAVES near mid-stem; calyx 7-9 mm. long; late spring to summer; lowlands, Ala. and Ga. .... *P. carolina turritella.*
        - LARGEST LEAVES above mid-stem; calyx 6-8 mm. long; summer to autumn; uplands, Ga. to N. C. .... *P. carolina altissima.*
      - PRINCIPAL LEAVES linear to elongate-lanceolate or exceptionally short elliptic on new growth, well-spaced; no persistent shoots developed; calyx 6-8 (9) mm. long, the junction-membranes moderately broad; late spring; lowlands, e. Tex. to Fla., s. Wisc. and ne. N. C. (or adj. Va.?) .... *P. glaberrima.*
  - ROOTSTOCK slender, elongate, turning up at tip into a solitary stem, which is strongly red-maculate, or green in mutants; nodes numerous, crowded; upper leaves and lower bracts lanceolate to ovate, cordate at base; inflorescence cylindric or exceptionally narrow-conical, often elongate; calyx 6-8 mm. long, the junction-membranes fairly broad; late spring to autumn; N. C. to Que. and Minn. .... *P. maculata.*

In Defense of the Validity of William Bartram's Binomials *

E. D. Merrill

But for the fact that various references in Rafinesque's numerous botanical papers which were under examination in connection with the preparation of an " Index Rafinesquianus " involved me in an examination of Bartram's " Travels ", it is highly probable that this paper would not have been prepared. Normally, like Professor Fernald, I probably should tacitly have accepted Dr. Rickett's[1] conclusions regarding the non-validity of Bartram's binomials, and thought no more about the matter. However, in connection with Rafinesque's reference to Bartram, I found it essential to prepare an index to the technical names of plants used by the latter. While a number of the Bartram names were accepted soon after they were published and have been recognized by all botanists as valid, many others have consistently been overlooked. A high percentage of those that were entered in our standard indices have either incomplete or erroneous references. With this background, and after a rather critical examination of the compiled Bartram data I am personally convinced that, whether we like it or not, we must continue to consider Bartram's Travels as a legitimate source of properly published binomials in botany. In this opinion I have the support of all of my associates at the Gray Herbarium and the Arnold Arboretum with whom the matter has been discussed.

---

* Editor's Note.—Because William Bartram (1739-1823) was a Philadelphian it seems appropriate that this discussion of the Latin names of plants that appeared in his classic "Travels through North & South Carolina, Georgia, East & West Florida, the Cherokee Country, the extensive territories of the Muscogulges, or Creek Confederacy, and the country of the Chactaws; containing an account of the soil and natural productions of those regions, together with observations on the manners of the Indians", first published in Philadelphia in 1791, should appear in our journal. William Bartram was traveling from 1773 to 1777, and so returned to our city after the Revolutionary War had begun; by the time peace was made both his English patron, Dr. John Fothergill (1712-80), and the botanist who was to have identified his plants, Daniel Solander (1736-82), had died. Although William Bartram's specimens duly reached England and are still preserved at the British Museum (Natural History), it is understandable why he never received lists of their names and why in his published " Travels " he mentioned only incidentally the many new species for which he supposed that sometime adequate scientific descriptions would appear abroad. For a recent account of William Bartram, see Dr. Witmer Stone in Bartonia 12S: 20-23, 1931; for a bibliography of works by him and also about him see Dr. John H. Barnhart in Bartonia 12S: 55-66; and for the original report of his travels in Georgia and Florida, with abundant critical annotations, see Dr. Francis Harper in Trans. Amer. Philos. Soc. II. 33; 121-242, pls. 1-26, 1943. In two articles in Bartonia 21: 6-8, 1942, and 22: 3, 1943, Dr. Harper has advocated the adoption of certain neglected names from the "Travels", while in Rhodora 46: 389-391, 1944, Dr. H. W. Rickett of the New York Botanical Garden has opposed that course. Now we welcome a careful consideration of the whole problem by Dr. E. D. Merrill of Harvard University.

[1] **Rickett, H. W.**, " Legitimacy of names in Bartram's ' Travels '." Rhodora **46**: 389-391. 1944.

As I interpret the Bartram entries the number of different names that he used *as binomials* is about 358 as compared with only two " descriptive phrases " or entries without binomials, for plant species. I maintain that this proportion of 358 to 2, as between binomials and polynomials is too great in favor of the former to justify the elimination of Bartram's work on the basis of Article 86 of the International Rules. He cites the same binomial from one to many times, there actually being about 950 binomial entries in the volume. Examples of binomials mentioned over and over again are *Magnolia grandiflora* Linn. (28), *Laurus borbona* Linn. (21), *Aesculus pavia* Linn. (17), *Morus rubra* Linn. (17), *Fagus sylvatica* Linn. (14), *Juglans nigra* Linn. (12), and *Quercus tinctoria* Bartr. (12).

Article 86 of the International Rules of Botanical Nomenclature was prepared to take care of certain publications that were issued in the transitional period following the publication of the binary system in 1753, for certain authors did not accept the later system, preferring to follow the more cumbersome earlier one, and yet here and there published " accidental " binomials after 1753. Rumphius' " Herbarium Amboinense " is a classical example, the manuscript of which was prepared in the closing decades of the seventeenth century, the six volumes forming the work proper being published between the years 1741 and 1750; the " Auctuarium " was not published until 1755, two years after the " Species Plantarum " was issued. The work is a typical pre-Linnaean one and all of the volumes contain numerous incidental binomials as well as monomials and polynomials. The incidental binomials published in the six volumes that were issued between 1741 and 1750 have no standing under the binary system, and those published in the Auctuarium in 1755 are illegitimate under Article 86 of the Rules.

Dr. Rickett concludes that the new binomials published in Bartram's Travels should be ignored on the basis of Article 86 of the Rules which provides that specific epithets are illegitimate when they are published in works in which the Linnaean system of binary nomenclature was not consistently employed. In a note appended to Rickett's paper, Professor Fernald accepted his conclusions. To prove his point Dr. Rickett cites a number of entries which he interprets as polynomials, yet in opposition I maintain that in all but two of the cited cases, the first two words of each phrase consists of a generic and a specific name, or actually binomials, some proposed by earlier authors, some proposed by Bartram as new, and that the remaining words in each entry are descriptive of the species under consideration. In some cases the descriptions are in Latin, in others in English only, and in still others both in Latin and English.

There are only two botanical entries in the entire work where species are described by Latin phrases, without a binomial. One is " Ipomea, caule erecto, ramoso, tripedali, fol. radicalibus . . ." p. 376, yet elsewhere in the book we note the entry " Ipomea erecta ", p. 59, from which we may assume that it was Bartram's *intent* to associate this binomial with the descriptive sentence quoted; there is no cross reference. The other case is " the fantastic Clitoria . . . (Clit. caule volubili, fol. ternatis pennatisque . . .) " p. 243, for neither here nor elsewhere in the volume is there a binomial for this species. Dr. Rickett cites one case with a [Linnaean] binomial followed by a descriptive sentence, in " (Smilax pseudo China; Smilax aspera, fructu nigro, radice nodosa . . .) " where Bartram quotes Sloane's descriptive phrase, either from Sloane's work or from Linnaeus' Species Plantarum 1031. 1753. A more striking case that he did not note is " (Panicum hirtellum, gramen panicum maximum, spica divisa, aristis armatum, Sloan, Jam. Cat. p. 30) ", p. 430, for here Bartram deliberately added a binomial, *Panicum hirtellum,* to Sloane's descriptive sentence which is " Gramen paniceum maximum, spica divisa, aristis armatum." Clearly as *Smilax pseudo-china* is the Linnaean binomial, so also is *Panicum hirtellum* a Bartram binomial, even if the former is set off by a semicolon, and the latter by a comma only. I do not consider, as Dr. Rickett does, that the entries " Pinus taeda, foliis geminatis et trinis, . . .", and " Pinus palustris, foliis trinis, . . .", p. 378, " Magnolia pyramidata, foliis ovatis . . .", p. 408, and " Corypha repens, frondibus expansis . . .", p. 61, to be *polynomials,* but rather the first two words of each form the *binomial,* for *Pinus taeda* Linn., *Pinus palustris* Mill., or at least as the latter was interpreted by Walter, *Magnolia pyramidata* Bartr., and *Corypha repens* Bartr. Elsewhere in the work Bartram cites as *binomials,* in *Pinus taeda* seven times, *P. palustris* eight times, *Magnolia pyramidata* once, and *Corypha repens* twice. Another striking case, not cited by Dr. Rickett, is that of *Aesculus,* p. 476; " Aesculus pavia, floribus coccineis, caule suffruticoso, Aesculus sylvatica, floribus ex albo et carneo eleganter variegatis, caule arboreo." We can only assume that here Bartram intended by the first *Aesculus pavia* Linn. to which he added a short descriptive phrase to contrast it with *Aesculus sylvatica* which he proposed as new; elsewhere in his work Bartram cites *Aesculus sylvatica* five times as a binomial without descriptive data. " Stewartia montana, fol. ovatis acuminatis, serratis, flor. nivea, staminum corona fulgida, pericarp. pomum exsuccum, apice acuminato dehiscens," p. 334, is another case in point, for from the binomial *Stewartia montana* a foot note is supplied: " This is a new species of Stewartia, unknown to the European botanists and not mentioned in any catalogues." How is it possible to interpret this long entry as a polynomial when Bartram definitely states that *Stewartia montana,* which he proceded to describe, is a new species and for which he deliberately published a binomial?

What was Bartram's *intent?* I think that it is clear, from the published record, that he definitely planned to follow the binomial system, for in botany he was thoroughly familiar with this. He was also familiar with Catesby's polynomial names for birds. The transitional period from the pre-Linnaean to the binary system had long since passed when Bartram prepared his text. He cites no less than about 358 different binomials for plants, *as binomials*, some of them listed many times as he observed the same species here and there in his travels; the total, including repetitions, is about 950 as noted above. He accepted those binomials previously published for species with which he was familiar, and incidentally proposed no less than about 130 new ones for species that were new to him. As some of his binomials were consistently accepted by numerous early authors as far as they were noted, beginning with Willdenow in 1799, I maintain that Bartram should not be penalized at this late date, merely because he lapsed from the binomial system in two cases only as noted above, and apparently in both cases by oversight rather than by intent. Yet the *Ipomoea* case, cited above, is specifically mentioned by Dr. Rickett as indicating that " we can admit no further doubt " as to Bartram's use of polynomials; he probably did not note the entry *Ipomea erecta* on page 59. As to whether or not it was Bartram's intent to follow the binomial system, the entry on page 164 supplies some evidence. In the description of *Cacalia heterophylla* he says: " (Syngenesia Polygamia Oqul. [Aequalis])", here indicating the Linnaean group to which his new species belonged.

It may be noted in passing that when Linnaeus established the binomial system in 1753 he was not wholly consistent, for in the Species Plantarum, we note *Apocynum fol. androsaemi.* Other types of Linnaean specific names that have been objected to are *lachryma jobi, bursa pastoris, unguis cati, coma aurea, linum stellatum* (*Lysimachia*), *trich*[*omanes*] *dentatum, trich*[*omanes*] *ramosum, adiant*[*um*] *nigrum,* and *ruta muraria,* these under *Asplenium, capillus veneris* (*Adiantum*), *f*[*ilix*]*mas, f*[*ilix*] *femina, f*[*ilix*] *fragile,* these under *Polypodium, crista castrensis* (*Hypnum*), *flos aquae* (*Byssus*) and *morsus ranae* (*Hydrocharis*). In the past some of these forms have been simplified as *lachryma, bursa, unguis, morsus,* etc., but in general they are now universally accepted in their original forms. There is no question as to Linnaeus' intent regarding the binomial system.

The argument is advanced that had Bartram intended to publish new binomials he would have indicated them by the use of italics. In no case in the entire work are italics or other special type forms used for either binomials, polynomials, or for binomials associated with descriptive sentences except in " Ixea caelestina " the description of which is published on plate [3] opposite p. 155. Neither are the plant names differentiated in the text of the three English editions, 1792, 1793, and 1794, but they are differentiated by italics or otherwise in the German, Dutch, and French translations. Had Bartram's binomials been set off by use of special type it is probable that more of his new ones would long since have been detected and listed. In these later editions some of Bartram's misspelled technical names are corrected. Bartram very seldom cited the authority for the binomial that he used, whether these be those proposed by earlier authors, such as Linnaeus and Walter, or by himself. Of the 123 new binomials proposed by him he very seldom indicated that such names were new, and never cited his own name as the authority. He wrote a book of travel, not a botanical treatise, and like other early authors liberally interspersed in the text the technical names for both plants and animals that he observed; if he were to mention these at all, no other course was available to him, for many of the plants that he observed at that time had no widely used English names.

To me it is evident that in botany Bartram intended to follow the binomial system. Admittedly, the majority of his new names are *nomina nuda,* but nevertheless they are binomials. It makes little or no difference whether or not the numerous *nomina nuda* be even listed, although names in this category are rather consistently entered in Index Kewensis. There are about 46 cases where the new names are provided with shorter or longer descriptions or with notes or illustrations whereby identifications might be made, and I hold that these should be accepted; and further that where the species are recognizable, and Bartram's specific names are valid, they should be adopted even if new transfers are involved in a few additional cases. In the zoological field, while his names are for the most part binomials, the percentage of polynomials is slightly higher than in botany. He cites technical names for birds, fishes, and other animals in about 300 cases, and the vast majority of these are in binomial form. I am not in a position to discuss the validity or non-validity of the Bartram binomials in zoology as I am not familiar with the provisions of the zoological code of nomenclature. In any case zoological usage does not effect the status of the botanical names. Messrs. Hubbs, Fowler, Goldman, and F. Harper accept Bartram's binomials in zoology as validly published, while others object to them for one reason or another, and those who do accept them insist that there are no provisions in the zoological code by which they can be eliminated. This is a matter for the zoologists themselves to settle.

Bartram was our first ecologist. He was primarily concerned with writing a readable account of his travels, and this included many descriptions of the various types of vegetation that he observed. His general botanical usage is indicated in the following quoted passages:

" At this rural retirement were assembled a charming circle of mountain vegetables, Magnolia auriculata, Rhododendron ferrugineum, Kalmia latifolia, Robinia montana, Azalea flammula, Rosa paniculata, Calycanthus Floridus, Philadelphus inodorus, perfumed Convalaria majalis, Anemone thalictroides, Anemone hepatica, Erythronium maculatum, Leontice thalictroides, Trillium sessile, Trillium cesnum [cernuum], Cypripedium, Arethuza, Sanguinaria, Viola[,] uvularia, Epigea, Mitchella repens, Stewartia, Halesia, Styrax, Lonicera &c." p. 342, and " Halesia, Stewartia, Aesculus pavia, Aesc. alba, Aesc. Florid. ramis divaricatis, thyrsis grandis, flosculis expansis, incarnatis, Azalea &c. entangled with garlands of Bignonea crucigera, Big. radicans, Big. sempervirens, Glycine frutescens, Lonicera sempervirens &c." p. 401. These are only two of numerous passages of this type in Bartram's Travels, the first passage being merely a list of binomials with a few generic names standing alone, the second a similar one but with one new binomial followed by a short descriptive Latin phrase. To illustrate another type of usage wherein English names of plants, generic names and binomials are involved, a common practice in Bartram's work is: "The forests consist chiefly of Oak, Hickory, Ash, Sour Gum (Nyssa sylvatica), Sweet Gum (Liquid-amber styraciflua), Beech, Mulberry, Scarlet maple, Black walnut, Dogwood, Cornus Florida, Aesculus pavia, Prunus Indica, Ptelea, and an abundance of Chesnut (Fag. castania) on the hills, with Pinus taeda and Pinus lutea," p. 400. In the above quoted passages, the element of description is mostly absent, and they read like lists of plants in certain types of modern ecological papers.

In contrast to these he sometimes lapses into really descriptive phrases, often distinctly poetic in nature, as: "The pompous Palms of Florida, and glorious Magnolia, strikes us with the sense of dignity and magnificence; the expansive umbrageous Live-Oak * with awful veneration, the Carica papaya, supercilious with all the harmony of beauty and gracefulness; the Lillium superbum represents pride and vanity; Kalmia latifolia and Azalea coccinea, exhibit a perfect show of mirth and gaiety; the Illicium Floridanum, Crinum Floridanum, Convalaria majalis of the Cherokees, and Calycanthus floridus, charm with their beauty and fragrance." Introduction, p. xvi, xvii; "How gently flow thy peaceful floods, O Alatamaha! How sublimely rise to view, on thy elevated shores, yon Magnolian groves, from whose tops the surrounding expanse is perfumed, by clouds of incense, blended with the exhaling balm of the Liquid-amber, and odours continually arising from circumambient aromatic groves of Illicium, Myrica, Laurus, and Bignonia," p. 48; "What a beautiful display of vegetation there is before me! seemingly unlimited in extent and variety; how the dew-drops twinkle and play upon the sight, trembling on the tips of the lucid, green savanna, sparkling as the gem that flames on the turban of the Eastern prince; see the pearly tears rolling off the buds of the expanding Granadilla *; behold the azure fields of the cerulean Ixea! what can equal the rich golden flowers of the Cana lutea, which ornament the banks of yon serpentine rivulet, meandering over the meadows; the almost endless varieties of the gay Phlox, that enamel the swelling green banks, associated with the purple Verbena corymbosa, Viola, pearly Gnaphalium, and silvery Perdicium; how fantastical looks the libertine Clitoria, mantling the shrubs, on the vistas skirting the groves." p. 155. These graphic word pictures enable even the casual reader to visualize something of what he actually saw and described, and they are in sharp contrast to mere lists of technical names, such as are prepared for the use of botanists only.

---

* Quercus sempervirens

* Passiflora incarnata, called May-Apple

Undoubtedly it was Bartram's intent that the new species in his botanical collections should be described by British botanists with whom he was in correspondence, and to whom he sent specimens. Faced as he was with the necessity of using technical names of plants in connection with the fascinating account of his travels, he clearly used those of named species with which he was familiar, and for many of those that were new to him he coined new names, some with shorter or longer descriptions, more as *nomina nuda*. Whether or not we accept his published and described species is more or less beside the point. We must, however, admit, that he did the best that he could under the circumstances, for no author, writing a popular account of his travels could intersperse too many actual technical descriptions of plants and still produce a readable or popular book.

Bartram was inconsistent. Sometimes his binomials are in parentheses, followed or preceded by the descriptions; sometimes the parentheses enclose both the name and the description, but more often they are absent; sometimes the binomial is in the clear and the description is in parentheses. In a number of cases he provided brief Latin diagnoses without supplementary English descriptions, or sometimes supplemented by the latter; again he sometimes provided English descriptions only. Occasionally he published binomials such as *Bartramia bracteata*, p. XVIII, and *Bignonia bracteata*, p. 468, disassociated with the description of the plant, which in this case appears in the text (without a name), on p. 16; see infra, p. 23. He almost never indicated authorities for binomials that he used. There is no differentiation in the text as between his plant names and the general text. In addition to these lapses from what is now assumed to be good botanical usage he not infrequently described species for which, occasionally, he indicates no generic name. Thus for the wild lime or tallow nut, p. 114, no technical name is indicated, his description of which in later years became the whole basis of Rafinesque's monotypic genus *Pimecaria* = *Ximenia* Linn., the species *P. odorata* Raf. = *X. americana* Linn. In other cases he indicated the genus as in the *Aesculus* or *Pavia* sp. which he described on p. 395, this Bartram description later becoming the whole basis of *Macrothyrsus odorata* Raf. Alsogr. Am. 75. 1838 (*Aesculus stolonifera* Raf. l.c., in syn.). In general it is possible accurately to identify most of the entities that Bartram actually described, either from his technical or cursory descriptions, or from appended notes. Here it is, of course, important that the exact localities be considered, for a knowledge of what species grow in certain localities or in certain habitats is not only desirable but essential.

I have accordingly compiled the following data from Bartram, listing all of his new species with their original descriptions, and a supplementary longer list of his *nomina nuda*. About 105 of these names do not appear in our standard indices, but merely because they have been overlooked for a century and a half is no argument against their being at least listed; after all, we do have a homonym rule. Perhaps Dr. Rickett did not note the extraordinary high percentage of unlisted names, or if he did, he perhaps considered that their listing was unnecessary in view of his contention that none of the binomials in Bartram's Travels was validly published. In most of the Bartram names that have been listed there are minor errors in the references, chiefly because most of the entries are to the so-called second edition of his Travels (1794) [2] rather than to the first edition (1791), and there is a slight discrepancy in the pagination of the two following page 48 of the second edition. In at least one case the reference is to the German edition of 1793; in other cases the references are to later works of Michaux, Dumont-Courset, Pursh, de Candolle, Steudel, and other authors, who accepted Bartram names.

It is indeed regrettable that so many of the Bartram names have been overlooked for so many years. Personally, however, I prefer to accept the changes that have been made by competent botanists. I defer to such authorities as Small, Pennell, Fernald, and others who in recent years have taken up Bartram names, and no one can criticize the various earlier authors, from Wildenow on, who accepted Bartram's work in good faith. If we eliminate the names in Bartram's Travels for any reason, this merely adds to our difficulties. Thus Dr. Rickett states that *Hydrangea quercifolia* Bartr. may be attributed to Nuttall, Gen. **1**: 284. 1818, but Willdenow accepted the species and provided it with a formal Latin description nineteen years earlier in *Hydrangea quercifolia*, Sp. Pl. **2**: 634. 1799, citing Bartram's illustration from the German edition of 1793.

For the most part Willdenow considered only those species that Bartram illustrated, these being *Andromeda pulverulenta, Annona obovata* Willd. (*A. grandiflora* Bartr., non Lam.), *Annona pygmea, Hydrangea quercifolia,* and *Ixia coelestina;* he correctly reduced *Magnolia auriculata* Bartr. to the earlier *M. auriculata* Lam. Even if we eliminate Bartram's Travels as the source of accepted names, we do not eliminate the work as one that must be consulted, for in some cases his descriptions of individual species are better than are those of later authors, while his illustrations of plants are excellent. Furthermore, we would be faced with the difficult task of determining what later author first accepted and re-described a Bartram species, whether this be Willdenow, Persoon, Michaux, Roemer & Schultes, Sprengel, Pursh, Nuttall, Elliott, Rafinesque, de Candolle, Chapman, or some other botanist, and unless one makes a really thorough search one may easily go as far astray as did Dr. Rickett in the case of *Hydrangea quercifolia* Bartr.

A consideration of Bartram's plant names led me to examine Marshall's "Arbustum * Americanum" (1785), in which certain species are described for the first time, among them several that are currently credited to Marshall. In the following cases the technical names should be credited to " Bartram ex Marshall." They are all indicated as from " Bartram's Catalogue ", and are *Andromeda nitida*, p. 8, *A. plumata*, p. 9, *Franklinia alatamaha*, p. 49, *Lonicera canadensis*, p. 81, and *Nyssa ogeche*, p. 97. Four of these appear in Bartram's undated " Catalogue of American trees, shrubs and herbaceous plants, most of which are now growing, and produce ripe seed in John Bartram's garden, near Philadelphia, the seeds and growing plants of which are disposed of on the most reasonable terms." Here they are all *nomina nuda*. My conclusion regarding these " Bartr. ex Marshall " binomials is antedated by E. L. Little in his recent paper " Miscellaneous notes on nomenclature of United States trees " in Amer. Midl. Nat. **33**: 494-513. 1945. This paper appeared after my manuscript had been sent to the printer. Little independently reached the same conclusion that I did regarding the Bartram binomials that appeared as *nomina nuda* in his Catalogue and later in Marshall's work with descriptions, in that the authority for these should be not Marshall but Bartram ex Marshall. (See his discussion of the names in Bartram's Catalogue, op. cit. 502-503.)

---

[2] This 1794 London issue was actually the fourth printing of the book in its original English version, as the first London edition appeared in 1792, followed by the Dublin issue in 1793. These three issues were from the same plates, differing only in the imprint at the bottom of the title pages.

* EDITOR'S NOTE.—Either by typographical slip or through error Marshall wrote "Arbustrum", but botanical contemporaries cited the name as "Arbustum" and we should do the same. Thus, Darlington in his "Memorials of John Bartram and Humphry Marshall" (p. 489, 1849) calls the work "Arbustum Americanum."

This Bartram catalogue is an undated folio broadside, and a photostat copy of the only original known is in the library of the Arnold Arboretum. This has marginal annotations by Humphry Marshall, and was doubtless the copy he had in hand when he prepared the data for his " Arbustum Americanum." This indicates that it was published in or before 1785. Marshall states in a footnote, p. XX: " *The Reader is requested to observe that the names of the Species, under which the words,* Bartram's Catalogue *immediately occur, are not found in Linnaeus's Species Plantarum, but are taken from the Sheet Catalogue published by John and William Bartram, Botanists in Kingsessing; containing the names of Forest Trees and Shrubs in, or near, their Garden.*" Curiously *Franklinia alatamaha*, as described on page 49 of Marshall's work, appears in the Bartram Catalogue merely as "Alatamaha ", column five of the broadside. However, Marshall says regarding the genus and species: " This newly discovered, rare, and elegant flowering shrub, was first observed by John Bartram when on botanical researches, on the Alatamaha river in Georgia, anno 1760 [1765]; but was not brought into Pennsylvania until about fifteen years after, when his son, William Bartram, employed in like pursuits, revisited the place where it had been observed and had the pleasing prospect of beholding it in its native soil . . . and bearing ripe seeds . . . some of which he collected and brought home . . . . William Bartram, who first introduced it, believing it to be a new genus, has chosen to honour it with the name of that patron of sciences, and truly great and distinguished character, Dr. Benjamin Franklin. The trivial name is added from the river, where alone it has been observed to grow naturally." If further evidence be needed as to the proper authority of the names cited above, Bartram notes on page 466 of his

Travels: " I presently found striking characteristics abundantly sufficient to separate it from that genus [*Gordonia*], and to establish it the head of a new tribe, which we have honoured with the name of the illustrious Dr. Benjamin Franklin, Franklinia Alatamaha."

Regardless of what may be done by systematists as to the acceptance or rejection of the binomials published in Bartram's Travels, many of which were accepted by botanists before the middle of the last century, the book itself should be in every botanical library. It is true that the first edition is now in that very expensive category of a collector's item, and is rarely offered by dealers. The complete original title is: " Travels through North & South Carolina, Georgia, East and West Florida, the Cherokee country, the extensive territories of the Muscogulges, or Creek Confederacy, and the country of the Chactaws; containing an account of the soil and natural productions of those regions, together with observations on the manners of the Indians ", i-xxxiv. 1-522, frontisp., map, 7 *t*. Philadelphia, James & Johnson, 1791. Plate 4 only is numbered. However, a modern facsimile edition is now available in the 1940 reprint.[3]

Professor Lowes notes in his introduction to the 1940 edition that Bartram " exemplified that rarest of combinations—the mind of a scientist with the soul of a poet," briefly mentioning the influence that Bartram had on the English poets Coleridge and Wordsworth. Bartram's rather remarkable influence on literature, which has attracted the attention of various investigators, is extensively discussed by N. B. Fagin, pages 127-203 of his " William Bartram, interpreter of the American landscape ", i-vii. 1-229. 1933. See also, J. L. Lowes " The Road to Xanadu " for Bartram's influence on Coleridge's imagery [3a]. When issued the book attracted immediate and favorable attention, both at home and abroad. It was re-published in London in 1792 and reprinted in Dublin in 1793, and again in London in 1794. The German edition, William Bartram's "Reisen durch Nord- und Süd-Karolina, Georgien, Ost- und West-Florida, das gebiet der Tscherokesen, Krihks und Tschaktahs, nebst umständlichen Nachrichten von den Einwohnern, dem Boden und den Naturprodukten dieser wenig bekannten grossen Länder," appeared in Vienna in 1793 as volumes nineteen and twenty of the Magazin von merkwürdigen neuen Reisebeschreibungen **19:** i-xxxix. [i-ix]. 1-403. *t.* [1-5]. 1793; **20:** 1-427. *t.* [*1-2*]. 1793, and was reprinted in single volume format under the same title in Berlin the same year, i-xxvi. 1-469 [501]. *t. 1-7.* 1793. The translation is by E. U. W. Zimmermann. A Dutch edition was issued in Haarlem in 1794 as: "Reizen door Noord- en Zuid-Carolina, Georgia, Oost- en West-Florida: De Landen den Cherokees, der Muscogulges, of het Creek bondgenootschap en het Land der Chactaws." i-xxvi. 1-695. 1794. The translation is by J. D. Pasteur. Bartram's illustrations were not reproduced. It was soon translated into French, with two issues, one An VII (1799), the other An IX (1801), as: "Voyage dans les parties sud de l'Amérique septentrionale; Savoir; les Carolines septentrionale et meridionale, la Georgie, les Florides orientale et occidentale, le pays des Cherokees, le vaste territoire des Muscogulges ou de la confederation, et le pays des Chactaws. Contenant des détails sur le sol et les productions naturelles de ces contrées, et des observations sur les moers des Sauvages qui les habitent." **1:** 1-457, frontisp., *t. 1-2;* **2:** 1-436, *t. 3.* An VII [1799]. The An IX [1801] issue is a reprint of this. The translation is by P. V. Benoist. And this several decades before the blast of the British reviewer regarding American publications: "Who reads an American book?" . . . but Bartram's fascinating volume was not a work of fiction. In the original Philadelphia edition only plate 4 is actually numbered (in the several copies that I have examined); in the other editions they are all numbered. They are not included in the Dutch edition.

---

[3] " The travels of William Bartram." Edited by Mark Van Doren with an introduction by John Livingston Lowes. 1-14, 1-414. 1940. Facsimile Library. Exclusive distributors Barnes & Noble, Inc. New York. This follows the original edition as to content, Bartram's plates not being reproduced, but differs in pagination. Another modern edition is that of Macy-Masius, New York, 1928, 414 pages; this follows the London edition.

[3a] The following statement is quoted from Van Wyck Brooks' recent " The World of Washington Irving," 110. 1945: " Numbers of these images, which appeared in Bartram's 'Travels,' reappeared in some of the world's great poems; for when the book was published, in 1791, it opened a new scene for romancers and poets. It passed into the mind of Coleridge, whence it reëmerged in two or three splendid passages in *Kubla Khan*. There one found the jetting fountains and the incense-bearing trees, together with other reminders of the Isle of Palms; and Bartram's wondrous fishes, attired in blue, red, blue and green, appeared in *The Ancient Mariner* as water-snakes. Wordsworth, too, read the book, and these pictures of the tropical forest passed into his poems, the green savannahs, the endless lakes, the fair trees, the gorgeous flowers, the magnolias, the azaleas that 'set the hills on fire' in *Ruth*. There one found the Indian maidens gathering strawberries in the wood, while Wordsworth's *Prelude* also bore traces of Bartram. Campbell's *Gertrude of Wyoming* was full of scenes from Bartram, and more than fifty pages of Chateaubriand's *Les Natchez* were drawn directly from his pages ", and in a footnote from this passage: " When Coleridge and Southey, reading Bartram, thought for a while of leaving England in order to live on the banks of the Susquehanna, they took it for granted that they would find there the scenery, flowers and birds of Florida. Thus Campbell, in *Gertrude of Wyoming*, which was based largely on Bartram, placed 'hills with high magnolia,' broad savannahas and the meteor-like flamingo in a valley that was also on the Susquehanna."

Believing that it is the duty of all taxonomists to call attention to unlisted binomials which are not infrequently noted as one scans both the older and occasionally some of the more recent botanical literature, this with view to making our standard indices ultimately complete, I have checked the Bartram names on both "Index Kewensis" and its Supplements, and on Christensen's "Index Filicum." In the following pages an asterisk (*) added to a name means that it is unlisted, and the sign † indicates that while the name is listed, the reference is either incomplete or erroneous as to the original place and date of publication. Most of the entries that are included in Index Kewensis are to the London issue of 1794, the first London edition being that of 1792, rather than to the original Philadelphia edition of 1791. This actual listing of overlooked or erroneously cited binomials is of real importance and value to all systematists, for until published names are actually included in standard indices of the type mentioned, they generally remain in that limbo of overlooked ones where the conservatives would be only too pleased if they there stayed indefinitely. However, whether or not we elect to accept a Bartram name, as noted above, we do have a homonym rule, and this rule alone should justify the listing of all published binomials. Had all of the Bartram names been listed at an earlier date, we would probably not, a century and a half after the book was published, be faced with the problem of accepting the valid ones and replacing specific names long used for this or that species; and maybe the question as to the validity or non-validity of Bartram's book as a source of binomials would not have been raised. Including strictly *nomina nuda* there are about 110 previously unlisted Bartram binomials, and about 8 minor corrections to be made to binomial entries that are listed in " Index Kewensis."

In preparing the following lists, I have, where descriptions or notes are concerned, quoted from the first Philadelphia edition of 1791. I have not concerned myself with minor variants in the spelling of technical names, such as Sideroxilon, Hybiscus, Euonismus (*Euonymus*), Acher (*Acer*), Sambricus (*Sambucus*), Drossea (*Drosera*), Halmea (*Kalmia*), Lantana Camerara, Laurus sasafras, Nymphaea nilumbo, Populus trimula, Pinus toeda, Trillium cesnum, Halesia taetraptera, etc., for such variants, with occasionally badly misspelled specific names such as ruelgare for *vulgare,* and usneascites, and ulneadscites for *usneoides,* are not uncommon in the text. These errors were due to inadequate proof reading or to slips of the pen. The critical reader will also note various false binomials that I have deliberately ignored, such as " Cercis tilia [Cercis, Tilia] " p. 28, " Itea stuartia [Itea, Stuartia] " p. 10, " Itea Clethra [Itea, Clethra] " p. 24, " Callicarpa Johnsonia [Callicarpa, Johnsonia] " p. 164, " Morus tilia [Morus, Tilia] " p. 221, and " Viola uvularia [Viola, Uvularia] " p. 242. These were inadvertent errors of a typographical nature and there is no warrant in listing them.

Any reader interested in following up Bartram's routes more closely, should study William Bartram's " Travels in Georgia and Florida, 1773-74: a report to Dr. John Fothergill," annotated by Francis Harper, in Trans. Am. Philos. Soc. II. **33**(2): 121-242. *t. 1-26.* 1943, for this forms an excellent supplement to Bartram's " Travels." I am under obligation to Dr. Harper who supplied various suggestions to me for the improvement of this paper, and especially for his courtesy in determining the exact places in which Bartram observed the species that he characterized as new.

In general, in this consideration of Bartram's binomials wherever he recorded a name that was published by Linnaeus, Walter, or other authors before 1790, for plants native of eastern North America, I have assumed that he correctly interpreted the species to which these names appertain. The remaining binomials were originated by Bartram. The number of these new Bartram binomials, about 130, is much larger than was anticipated before the lists were checked.

Bartram's Binomials With Descriptions, Notes or Illustrations [4]

In the following lists an asterisk (*) preceding a name indicates that there is no entry in "Index Kewensis" or in "Index Filicum"; the sign (†) indicates a correction to such an entry.

Aesculus *florida Bartr., Trav. 401. 1791, *descr.*; ed. 2, 399. 1792; Raf., Alsogr. Am. 70. 1838, *nom.*, *nota*; Fernald in Rhodora **46**: 48. 1944, *nom.*, *nota* (as *Aesculus floridana* Bartr.).

"Aesc. Florid. ramis divaricatis, thyrsis grandis, flosculis expansis incarnatis." Monroe or an adjacent county, Alabama. Status doubtful, but I judge it to be a form of *Aesculus pavia* Linn., as that species is interpreted by Small; see Fernald l.c., who completed the specific name as *floridana*. Whatever Bartram's intent may have been, either form of the specific name is admissible, and I accept the name as completed by Rafinesque. *Aesculus neglecta* Lindl. is suggested by Dr. Francis Harper.

Aesculus *sylvatica Bartr., Trav. 41, *nom.*, 320, *nom.*, 327, *nom.*, 335, *nom.*, 393, *nom.*, 476, *descr.* 1791; ed. 2, 41, 318, 325, 333, 391, 474. 1792.

"Aesculus sylvatica, floribus ex albo et carneo eleganter variegatis, caule arboreo." Ashwood, five miles northeast of Council, Bladen County, North Carolina, on Northwest Cape Fear River. Accepted by Fernald in Rhodora **46**: 47. 1944, as valid for what has hitherto been known as *Aesculus neglecta* Lindl. (1846).

Aesculus *virginiana Bartr., Trav. 393. 1791, *nom. alt. Aesculus sylvatica* Bartr. = *praec.*

Andromeda †formosissima Bartr., Trav. v, *nom.*, 24, *nom.*, *nota*, 172, *nom.*, 303, *nom.* 1791; ed. 2, iv, 24, 170, 301. 1792.

"The great evergreen Andromeda of Florida, called Pipe-stem Wood, to which I gave the name of Andromeda formosissima, as it far exceeds in beauty every one of this family." St. Mary's River at King's Ferry, Florida. There is no description. The Index Kewensis entry is to "Bart. Trav. N. & S. Car. Georg., ii. (1791)" = *Leucothoë acuminata* (Ait.) G. Don.

Andromeda †pulverulenta Bartr., Trav. *t.* [7]. opp. p. 476. 1791; ed. 2, *t. 7.* opp. p. 474. 1792.

There is no description, the binomial appearing only on the plate. The Index Kewensis entry is "Bartr. Trav. N. & S. Car. Georg. ii. 476." The first description was published by Wildenow, Sp. Pl. **2**: 610. 1799, as "Andromeda *pulverulenta* † A. pedunculis aggregatis, corollis campanulatis, foliis ovatis dentatis. W. Andromeda pulverulenta. *Bartram. it. ed. germ, p. 453, t. 8.*" 1793. The species is *Zenobia pulverulenta* (Willd.) Pollard.

An[n]ona †grandiflora Bartr., Trav. *t.* [2]. opp. p. 20. 1791; ed. 2, *t. 2.* opp. p. 19, 1792; non Lam. (1786).

There is no description other than: "I observed a new and most beautiful species of Annona, having clusters of large white fragrant flowers" (p. 18), the name appearing only on the plate. The Index Kewensis entry is "Bart. Trav. 20, & 171, t. 2." The description on page 171 (ed. 2, p. 169. 1792) appertains to the next binomial, but both clearly represent a single species. *Annona obovata* Willd. Sp. Pl. **2**: 1269. 1800, was based on Bartram's illustration, "*Bartram, itin. ed. germ. p. 20, tab. 2*" [1793]. Near Mt. Pleasant, Wayne County, Georgia = *seq.*

---

[4] In this account the first references are to the original Philadelphia edition of Bartram's Travels (1791); the references to the second edition are to the London edition of 1792, of which the Dublin, 1793, and the London issues of 1794 are reprints. Many of the hitherto recorded references are to the 1794 London issue. References to the German, Dutch, and French translations are not included, except in special cases where corrections to technical names are involved.

Annona †incana Bartr., Trav. v. *nom.*, 171, *descr.* (*A.* "*incarna*"). 1791; ed. 2, iv, 169. 1792 ("*A. incarna*"); Mag. Reisebeschr. **19**: *271*. *1793* (Bartr. Reise. **1**: *271*). (*A. incana*).

"Of the low shrubs many were new to me and of a very pleasing appearance, particularly a species of Annona (Annona incarna [incana]), floribus grandioribus paniculatis:) this grows three, four or five feet high, the leaves somewhat cuneiform or broad lanciolate, attenuating down to the petiole, of a pale or light green colour, covered with a pubescence of short fine down; the flowers are very large, perfectly white and sweet scented, many connected together on large loose panicles or spikes; the fruit of the size and form of small cucumber, the skin or exterior surface somewhat rimose or scabrous, containing a yellow pulp of the consistence of a hard custard, and very delicious wholesome food. This seems a variety, if not the same, that I first remarked [A. grandiflora Bartr.], growing on the Alatamaha near Fort Barrington, Charlotia, and many other places in Georgia and East Florida." Southeastern Putnam county, Florida = *Asimina incana* (Bartr.) Exell in Jour. Bot. **65**: 69. *t.* **581**. 1927 (lower figure), (*Annona grandiflora* Bartr., 1791, non Lam. 1786, *Annona obovata* Willd., *Asimina obovata* Nash, *Pityothamnus incanus* Small; see Exell in Jour. Bot. **65**: 59. 1927). The entry in Index Kewensis Suppl. **8** (1926) is "incana (sphalm. incarna), Bartram, Travels, ed. 2, 169 (1794), in obs."

Annona †pygmea Bartr., Trav. v, *nom.*, *t.* [*1*], opp. p. 18, *nom.*, 171, *nom.*, *nota*, (pigmea), 181, *nom.*, 1791; ed. 2, iv, *t. 1.* post p. 18, 169, 179. 1792.

The description, p. 18, without specific name in the text is: "In similar situations, and commonly a near neighbor of this new Kalmia, is seen a very curious species of Annona. It is a very dwarf, the stems seldom extending from the earth more than foot or eighteen inches, and are weak and almost decumbent. The leaves are long, extremely narrow, almost lineal. However, small as they are, they retain the figure common to the species, that is, lanceolate, broadest at the upper end, and attenuating down to the petiole, which is very short; their leaves stand alternately, nearly erect forming two series, or wings, on the arcuated stems. The flowers, both in size and colour, resemble those of Antrilobe [Annona triloba], and are single from the axilae of the leaves on incurved peduncli, nodding downwards. I never saw the fruit." The entry on p. 171 is: "I observed here in plenty, the very dwarf decumbent Annona, with narrow leaves, and various flowers already noticed at Alatamaha (Annona pigmea.)." Vicinity of Mt. Pleasant, Wayne County, Georgia, and in southeastern Putnam County, Florida.

The Index Kewensis entry is "pygmaea Bartr. Trav. 18, t. 1." The species was accepted by Willdenow, Sp. Pl. 2: 1286. 1800, the citation being to "*Bartram itin. ed. germ.* p. 21. t. 1" (1793). It is *Asimina pygmaea* (Bartr.) Dunal, Monog. Anon. 82, 84, 1817, synonyms being *Orchidocarpum pygmaeum* Michx., *Porcellia pygmaea* Pers., and *Pityothamnus pygmaeus* Small; see Exell in Jour. Bot. **67**: 69. *t. 581.* 1927 (upper figure), who considers that two species are involved which he recognizes as *Asimina pygmaea* (Bartr.) Dunal, the form *described* by Bartram, with *A. angustifolia* A. Gray as a synonym and *A. secundiflora* Shuttlew., the form *illustrated* by Bartram on plate [1], opposite p. 18. Exell's illustrations of the two closely allied species are reproductions of Bartram's drawings from the collections of the British Museum (Natural History). He also reproduces Bartram's original notes. Small, Man. Southeast. Fl. 531. 1933, reduced *Asimina secundiflora* Shuttlew. to *Pityothamnus pygmaeus* Small (*Asimina pygmaea* Dunal), but retained *A. angustifolia* A. Gray (as *Pityothamnus angustifolius* Small) as a distinct species. May he not have overlooked Exell's paper?

***Bartramia *bracteata** Bartr. Trav. xviii. 1791, *nom.* = **Bignonia *bracteata** Bartr. Trav. 468, 1791, *nom.*

There is some doubt as to whether or not these binomials should be considered as validly published, as there are no cross references and it is more or less by inference that we can associate them with the actual description, published without a binomial, on page 16; yet there is no doubt that his description and the note on p. 468 belong with the binomials from the context. The first is on page 16 following Gordonia (*Franklinia alatamaha* Bartr. ex Marsh.): "The other was equally distinguished for its beauty and singularity; it grows twelve or fifteen feet high, the branches ascendant and opposite, and terminate with large panicles of pale blue tubular flowers, specked on the inside with crimson; but what is singular, these panicles are ornamented with a number of ovate large brachtae [bracteae], as white, and like fine paper, their tops and verges stained with rose red, which, at a little distance, has the appearance of clusters of roses, at the extremities of the limbs; the flowers are Bl. [Cl.] Pentandria monogynia; the leaves are nearly ovate, pointed and petioled, standing opposite to one another on the branches." Alatamaha River, Georgia.

This is an excellent description of *Pinckneya pubens* Michx. (1803). On page 468, and there also following the description of *Franklinia alatamaha* Bartr. ex Marsh. this entry occurs: "The other new, singular and beautiful shrub, now here in full bloom, I never saw grow at but two other places in all my travels, and there very sparingly, except in East Florida, in the neighborhood of the sea-coast." In a foot note to this passage he states: "I gave it the name of Bignonia bracteata extempore." For those who may prefer to accept Bartram's earlier specific name the proper combination would be *Pinckneya *bracteata* (Bartr.) Raf. in Casket **1827**: 194. *fig. 17*. 1827, in Sat. Eve. Post. **6**: no. 303. [4]. *fig.* 1827, and to be added to the synonymy is *Mussaenda *bracteata* Raf. 11. cc., published as a synonym by that erratic author. Rafinesque deliberately accepted Bartram's specific name because it was earlier than that of Michaux; yet three years later, in again reproducing his really good illustration of the species, Med. Fl. **2**: 57. *fig. 72*. 1830, he returned to *Pinckneya pubens* Michx., not even citing *P. bracteata* (Bartr.) Raf. in synonymy. Dr. F. Harper, in Bartonia **21**: 7. 1942, independently published the transfer of Bartram's specific name to *Pinckneya* as *P. bracteata* (Bartr.) F. Harper. Perhaps the mere fact that such an erratic individual as Rafinesque correctly identified the Bartram entity and published an, as yet unlisted, transfer of the specific name to *Pinckneya*, is sufficient to damn the binomial in the minds of the conservatives = *Pinckneya bracteata* (Bartr.) Raf. (*P. pubens* Michx.).

Cacalia *heterophylla Bartr., Trav. 164. 1791; ed. 2, 162. 1792.

"Cacalia heterophylla, foliis cuneiformibus, carnosis, papil. viscidis," immediately preceded by a longer English description: "One of them particularly engaged my notice, which, from its fructification I take to be a species of Cacalia. It is an evergreen shrub, about six or eight feet high, the leaves are generally somewhat cuniform, fleshy and of a pale whitish green, both surfaces being covered with a hoary pubescence and vesciculae, that when pressed feels clammy, and emits an agreeable scent; the ascending branches terminate with large tufts or corymbs of rose coloured flowers, of the same agreeable scent; clusters of these flowers, at a distance, look like a large Carnation or fringed Poppy flower (Syngenesia Polyg. Oqul. [Aequalis] Linn.)." Near Salt Springs, west side of Lake George, Marion County, Florida.

Dr. Francis Harper, who has covered Bartram's routes thoroughly, informs me that in his opinion this is *Garberia fruticosa* (Nutt.) A. Gray, that it is still common in Bartram's type locality in the scrub near Salt Springs on the west side of Lake George, and that the fresh leaves are viscid. Bartram's specific name is much older than Nuttall's, so that a new combination is required. This, with the courage of our convictions that Bartram's names are valid and must be accepted, we do not hesitate to make in **Garberia heterophylla** (Bartr.) Merrill & F. Harper, *comb. nov.* (*Liatris fruticosa* Nutt. in Am. Jour. Sci. **5**: 299. 1822; *Garberia fruticosa* A. Gray in Proc. Acad. Nat. Sci. Philadelphia **1879**: 379. 1879; *Leptoclinium fruticosum* A. Gray in Proc. Am. Acad. **15**: 48. 1880).

Cleome *lupinifolia Bartr., Trav. 425. 1791; Raf., Fl. Ludovic. 135. 1817, *nom., nota.*

"I observed no new vegetable production, except a species of Cleome, (Cleome lupinifolia) this plant possesses a very strong scent, somewhat like Gum Assafetida, notwithstanding which the inhabitants give it a place in soups and sauces." Lake Ponchartrain, Louisiana. *Cleome edulis* Raf., op. cit. 86, very inadequately described, undoubtedly represents the same species.

Convolvulus *dissectus Bartr. Trav. 104. 1791; ed. 2, 102. 1792.

"I also saw a new and beautiful palmated leaved convolvulus*. This vine rambles over the shrubs, and strolls about on the ground, its leaves are elegantly sinuated, of a deep grass green, and sit on long petioles. The flowers are very large, infundibuliform, of a pale incarnate colour, having a deep crimson eye." Drayton's Island in Lake George, Putnam County, Florida. Bartram's new binomial actually represents the same species as the earlier *Convolvulus dissectus* Jacq., Obs. Bot. **2**: 4, 1767 = *Operculina dissecta* (Jacq.) House.

* Convolv. dissectus

Corypha *obliqua Bartr., Trav. 61, *descr.*, 1791; ed. 2, 59. 1792.

"Corypha obliqua, caudcx arboreus, adscendens, frontibus expansis, flabelliformibus, plicatis, stipit. serratis." St. Simons Island, Georgia = *seq.* See note on the variable habit of this species by Small, Man. Southeast. Fl. 242. 1933.

Corypha *repens Bartr., Trav. 61, *descr.*, 94, *nom.*, 242, *nom.*, 1791; ed. 2, 79, 92, 240. 1792.

"Corypha repens, frondibus expansis flabelliformibus, plicatis, stipit. spinosis (Dwarf Saw Palmetto)." St. Simons Island, Georgia = *Serenoa repens* (Bartr.) Small (*Chamaerops serrulata* Michx.; *Serenoa serrulata* Hook.).

Cucurbita *peregrina Bartr., Trav. 137. 1791; ed. 2, 135. 1792.

"It is exceedingly curious to behold the Wild Squash* climbing over the lofty limbs of trees; their yellow fruit somewhat the size and figure of a large orange, pendant from the extremities of the limbs over the water." Lake George, Florida. This seems to be the same as *Pepo okeechobeensis* Small (1930).

* Cucurbita peregrina

Fagus *chinkapin Bartr., Trav. 327. 1791; ed. 2, 325. 1792.

"Fagus pumila s. Chinkapin." Upper Savannah River, Ga.-S. Car. This is merely an alternate name, there being no description or note. It is possible that Bartram only intended to record the vernacular name of this well known species = *Castanea pumila* (Linn.) Mill.

Gerardea [Gerardia] *flammea Bartr., Trav. 412. 1791; ed. 2, 410. 1792.

"These stony, gravelly heights produce a variety of herbacious plants, but one in particular I shall mention on account of its singular beauty; I believe it is a species of Gerardea (Gerardea flammea), it grows erect, a single stem from a root, three or four feet in height, branching very regularly from about one half the length upwards, forming a cone or pyramid, profusely garnished with large tubular labiated scarlet or flame coloured flowers, which give the plant a very splendid appearance even at a great distance." Baldwin or an adjacent County, Alabama = *Macranthera flammea* (Bartr.) Pennell in Bull. Torr. Bot. Club **40**: 124. 1913. If Dr. Pennell be correct in his interpretation of Bartram's species, synonyms are: *Conradia fuschioides* Nutt., *Macranthera fuchsioides* Benth., *M. lecontei* Torr., *Russelia flammea* Raf., *Toxocarpus gymnanthes* Raf., *T. calycinus* Raf., *Tomilix bracteata* Raf., *Dasystoma tubulosa* Bertol., and *Conradia lecontei* O. Kuntze. However, Dr. R. M. Harper in Geol. Surv. Alabama Monog. **9**: 313, 1928, states: "Bartram's *Gerardia flammea* has been identified by Mohr (Plant Life, p. 15) [Contr. U. S. Nat. Herb. **6**: 15. 1901] and Pennell (Bull. Torr. Bot. Club **40**: 124, 405. 1913) with *Macranthera fuchsioides*, but that is a tall herb which grows in swamps, and would hardly be in bloom in August." He places *Gerardia flammea* Bartr. as a doubtful synonym of *Clinopodium coccineum*

(Nutt.) O. Kuntze, of the Labiatae.* Small gives the habitat of the latter as "sandy shores, sandhills, and hammocks, Coastal Plain, Fla. to Ala. and Ga." His habitat for *Macranthera flammea* (Bartr.) Pennell is: "Borders of wet sandy thickets, Coastal Plain, N. Fla. to E. La. and Ga."

Geum *odoratissimum Bart., Trav. 43. 1791; ed. 2, 43. 1792.

"I accidentally discovered a new species of Caryophyllata (Geum odoratissimum) on reaching to a shrub, my foot slipped, and, in recovering myself, I tore up some of the plants, whose roots filled the air with animating scents of cloves and spicy perfumes." On a tributary of the Broad River, Georgia. Status doubtful.

Hedera *carnosa Bartr., Trav. 243. 1791; ed. 2, 241. 1792.

"Hedera carnosa (Fol. quinatis inciso-serratis, perennentibus)". Near Long Pond, Levy County, Florida. Probably = *Parthenocissus quinquefolia* (Linn.) Planch.

Heracleum *maximum Bartr., Trav. 344. 1791; ed. 2, 342. 1792.

"I observed growing in great abundance in these mountain meadows, Sanguisorba Canadensis and Heracleum maximum, the latter exhibiting a fine shew, being rendered conspicuous even at great distance, by its great height and spread, vast pennatified leaves and expansive umbels of snow-white flowers." Near Clayton, Rabun County, Georgia = *Heracleum maximum* Bartr. (*H. lanatum* Michx.).

Fernald's expression of regret, Rhodora **46**: 50. 1944, at being obliged to abandon such a widely and universally used binomial as that of Michaux, led to the preparation of Rickett's paper on the legitimacy of names in Bartram's Travels, Rhodora **46**: 389-391. 1944, to which this paper is a rejoinder.

Hydrangea †quercifolia Bartr., Trav. xviii, *nom.*, 382, *t.* [*6*], *descr.*, 408, *nom.* 1791; ed. 2, xii, 380. *t. 6*, 406. 1792.

"I observed here a very singular and beautiful shrub, which I suppose is a species of Hydrangia (H. quercifolia). It grows in coppices or clumps near or on the banks of rivers and creeks; many stems usually arise from a root, spreading itself greatly on all sides by suckers or offsets; the stems grow five or six feet high, declining or diverging from each other, and are covered with several barks or rinds, the last of which being of a cinerious dirt colour and very thin, at a certain age of the stems or shoots, cracks through to the next bark, and is peeled off by the winds, discovering the under, smooth, dark reddish brown bark, which also cracks and peels off the next year, in like manner as the former; thus every year forming a new bark; the stems divide regularly or oppositely, though the branches are crooked or wreathe about horizontally, and these again divide, forming others which terminate with large heavy panicles or thyrsi of flowers, but these flowers are of two kinds; the numerous partial spikes which compose the pannicles and consist of a multitude of very small fruitful flowers, terminate with one or more very large expansive neutral or mock flowers, standing on a long, slender, stiff peduncle; these flowers are composed of four broad oval petals or segments, of a dark rose or crimson colour at first, but as they become older acquire a deeper red or purplish hue, and lastly are of a brown or ferruginous colour; these have no perfect parts of generation of either sex, but discover in their centre two, three or four papillae or rudiments; these neutral flowers, with the whole pannicle, are truly permanent, remaining on the plant for years, until they dry or decay; the leaves which clothe the plants are very large, pinnatifid or palmated and serrated, or toothed, very much resembling the leaves of some of our Oaks; they sit opposite, supported by slender petioles and are of a fine, full green colour." Sweet Water Brook = Knoxville Branch, Crawford County, Georgia. The Index Kewensis entry is: "Bartr. Trav. 382. t. 7; ed. 2. 380, cum tab. 6.", accepted by all authors as Bartram's species beginning with Willdenow, Sp. Pl. **2**: 634. 1799, nineteen years earlier than Nuttall to whom Rickett would accredit the binomial.

---

* EDITOR'S NOTE.—This problem has been reconsidered by me in Monog. Acad. Nat. Sci. Phila. 1: 414, 1935, with the conclusion that by lapse of memory or else by confusion of his notes Bartram has associated the statement of locality for *Clinopodium* with a description of *Macranthera*. The latter has precedence in identifying *Gerardia flammea*.

Hypericum aureum Bartr., Trav. 383. 1791; ed. 2, 381. 1792; non Lour. (1790).

"I observed growing on the steep dry banks of this creek a species of shrub Hypericum, of extraordinary shew and beauty (Hypericum aureum). It grows erect, three or four feet high, forming a globular top, representing a perfect little tree; the leaves are large, oblong, firm of texture, smooth and shining; the flowers are very large, their petals broad and conspicuous, which, with their tufts of golden filaments, give the little bushes a very splendid appearance." Patsilaga Creek, Taylor County, Georgia. The Index Kewensis entry is correct. = *Hypericum frondosum* Michx. (1803).

Ipomoea *erecta Bartr., Trav. 59. 1791, *nom.*; ed. 2, 57. 1792 (*Ipomea*).

On page 376 (ed. 2, 374. 1792) this entry occurs: "In the loose soil verging around this rock, grew several very curious herbaceous plants, particularly one of singular elegance and beauty, which I take to be a species of Ipomea (Ipomea, caule erecto, ramoso, tripedali, fol. radicalibus, pinnatifidis, liniaribus, humistratis, florib. incarnatis intus maculis coccinaeis adsperso). It grows erect, three feet high, with a strong stem, which is decorated with plumed or pinnatifid liniar leaves, somewhat resembling those of the Delphinium or Ipomea quamoclet; from about one half its length upwards, it sends out on all sides, ascendant branches which divide again and again; these terminate with large tubular or funnel formed flowers; their limbs equally divided into five segments; these beautiful flowers are of a perfect rose colour, elegantly besprinkled on the inside of their petals with crimson specks; the flowers are in great abundance and together with the branches and delicately cut fine leaves, compose a conical spike or compound pannicle. I saw a species of this plant, if not the same, growing on the sea coast islands near St. Augustine." Flat Rock, near Camak, Warren County, Georgia. In spite of the long description, which contains no binomial and no reference to the *nomen nudum* on p. 59, one may question the actual validity of "publication" of the binomial. The case is somewhat like that of *Bartramia bracteata* and *Bignonia bracteata* discussed on p. 23. The species is *Gilia rubra* (Linn.) Heller, of the Polemoniaceae, according to Long and Wherry.

Ixea [Ixia] †caelestina Bartr., Trav. *t.* [*3*], opp. p. 155. 1791; ed. 2. *t. 3*, opp. p. 153. 1792.

The description appears on the plate, not in the text, as: "IXEA CAELESTINA. *Rad. bulbosa, subrotunda.* Caulis *teres, vaginatus.* Foliis *lineari-lanciolatis, cuspidatis.* Floribus *expansis magnis caeruleis.* vid. Tourn." Lake Dexter, Volusia County, Florida. On p. 155 is a brief statement: "behold the azure fields of cerulean Ixea!" The Index Kewensis entry is "coelestina Bartr. Trav. ed. Germ. 152. t. 3 [1793]". This was accepted by Willdenow, Sp. Pl. 1: 200. 1797 (as *I. coelestina*) his reference being to the German edition of Bartram's Travels. = *Nemastylis coelestina* (Bartr.) Nutt., quoad syn. Nutt. (*Salpingostylis coelestina* Small).

Kalmia †ciliata Bartr., Trav. v, *nom.*, 7, *nom.*, 94, *nom.*, 171, *nom.*, *nota*, 242, *nom.* 1791; ed. 2, iv, 7, 92, 169, 240. 1792.

"Here is also abundance of the beautiful little dwarf Kalmia ciliata, already described" p. 171 (p. 169, ed. 2, 1792). On page 18 this entry is found: "I observed . . . . a diminutive but elegant Kalmia. The stems are very small, feeble, and for the most part undivided, furnished with little ovate pointed leaves, and terminate with a simple racemi, or spike of flowers, salver-formed, and of a deep rose-red. The whole plant is ciliated. It grows in abundance all over the moist savannas but more especially near ponds and bay-swamps." Mount Pleasant, Wayne County, Georgia. The other localities for those entries where only the binomial occurs are Colonel's Island, Liberty County, Georgia, St. John's River at Rollestown, and in southeastern Putnam County and near the Suwannee River, Florida. The entry in Index Kewensis is "Bartr. ex Dum-Cours. Bot. Cult. ed. II, iii. 323" [1811]. = *Kalmia hirsuta* Walt. (*Kalmiella hirsuta* Small).

Lupinus *breunis Bartr., Trav. 19, 1791; ed. 2, 19. 1792; Reizen Noord- en Zuid-Carolina 26, 1794; Voy. Am. Sept. **1**: 56. 1799.

"I also saw a beautiful species of Lupin, having pale green villous* lingulate leaves;

* Lupinus breunis, folus integerimis oblongis villosis.

the flowers are disposed in long erect spikes; some plants produce flowers of the finest celestial blue, others incarnate, and some milk white, and though they all three seem to be varieties of one species, yet they associate in separate communities, sometimes approaching each other's border or in sight at a distance. Their districts are situated on dry sandy heights, in open pine forests, which are naturally thin of undergrowth, and appear to great advantage; generally, where they are found, they occupy many acres of surface." Near Waynesville, Georgia. The specific name is clearly due to a typographical error, for as it stands it is meaningless. In the Vienna German edition of 1793 it is corrected to *Lupinus *brevis* Bartr., the reference being to Mag. Reisebeschr. **19**: 38. 1793 (Bartr., Reise **1**: 38). It is suspected that "biennis" was actually intended by Bartram, yet there is nothing in the description that would indicate either of these specific names. The status of the species is doubtful, and Dr. R. M. Harper thinks that the description may have included more than a single one, perhaps *Lupinus diffusus* Nutt. and *L. villosus* Willd. being involved.

Lycium †salsum Bartr. Trav. 59. 1791; ed. 2, 57. 1792.

"Lycium salsum (perhaps L. Afrum Linn.) a very beautiful ever green shrub, its cerulean flowers, and coral red berries, always on its branches, forming not the least of its beauties." St. Simon's Island, Georgia. The entry in Index Kewensis is "Bartr. Trav. ed. II. 57" = *Lycium carolinianum* Walt. (1788).

Magnolia *auriculata Bartr., Trav. 320, *nom.*, 339, *descr.*, 364, *nom.*, 402, *nom.*, 408, *nom.*, *nota*, 1791; ed. 2, 318, 337, 362, 400, 406, 1792.

"This exalted peak I named mount Magnolia*, from a new and beautiful species of

* Magnolia auriculato

that celebrated family of flowering trees, which here, at the cascades of Falling Creek, grows in a high degree of perfection, for although I had noticed this curious tree several times before, particularly on the high ridges betwixt Sinica and Keowe, and on ascending the first mountain after leaving Keowe, when I observed it in flower, but here it flourishes and commands our attention.

"This tree, or perhaps a shrub, rises eighteen to thirty feet in height, there are usually many stems from a root or source, which lean a little, or slightly diverge from each other, in this respect imitating the Magnolia tripetala; the crooked wreathing branches arising and subdividing from the main stem without order or uniformity, their extremities turn upwards, producing a very large rosaceous, perfectly white, double or polypetalous flower, which is of a most fragrant scent; this fine flower sits in the center of a radices of very large leaves, which are of a singular figure, somewhat lanciolate, but broad towards their extremities, terminating with an acuminated point, and backwards they attenuate and become very narrow towards their bases, terminating that way with two long narrow ears or lappets, one on each side of the insertion of the petiole; the leaves have only short footstalks, sitting very near each other, at the extremities of the floriferous branches, from whence they spread themselves after a regular order, like the spokes of a wheel; their margins touching or lightly laping upon each other, form an expansive umbrella superbly crowned or crested with the fragrant flowers, representing a white plume; the blossom is succeeded by a very large crimson cone or strobile, containing a great number of scarlet berries, which, when ripe, spring from their cells and are for a time suspended by a white silky web or thread. The leaves of these trees which grow in a rich, light, humid soil, when fully expanded and at maturity, are frequently above two feet in length and six or eight inches where broadest." About four miles northeast of Clayton, Rabun County, Georgia. = *Magnolia fraseri* Walt. (*M. auriculata* Desr. in Lam. Encycl., **3**: 673. 1791).

On page 408 this entry appears: "how gaily flutters the radiated wings of the Magnolia auriculata? each branch supporting an expanded umbrella, superbly crested with a silver plume, fragrant blossom, or crimson studded strobile and fruits!"[5]

Magnolia †pyramidata Bartr., Trav. 6, *nom.*, 408, *descr.*, 1791; ed. 2, 7, 406. 1792.

"Magnolia pyramidata, foliis ovatis, oblongis, acuminatis, basi auriculatis, strobilo oblongo ovato." Upper Tensaw River, Baldwin County, Alabama. The Index Kewensis entry is "Bartr. ex Pursh. Fl. Am. Sept. ii. 382. [1814]," but Pursh at the end of his diagnosis cites "*Bartr. trav.* p. . . ." The *Magnolia* briefly described by Bartram, Trav. 340. 1791. (ed. 2, 338) but there unnamed, undoubtedly represents *Magnolia pyramidata* Bartr.: "I discovered in the maritime parts of Georgia, particularly on the banks of the Alatamaha another new species of Magnolia, whose leaves were nearly of the figure of those of this tree [Magnolia auriculata Bartr.], but they were much less in size, not more than six or seven inches in length, and the strobile very small, oblong, sharp pointed and of a fine crimson colour, but I never saw the flower. These trees grow straight and erect, thirty feet or more in height, and of a sharp conic form, much resembling the Cucumber tree (*Magnolia acuminata*) in figure." See F. Harper in Bartonia **21**: 7-8. 1942.

Mimosa *virgata Bartr., Trav. 421. 1791 (sphalm. *virgatia*); ed. 2, 419. 1792 (*virgata*); non Linn.

"Here are a few shrubs . . . together with several new genera and species of herbaceous and suffruticose tribes . . . particularly a species of Mimosa (Mimosa virgatia) which in respect to the elegancy of its pinnated leaves, cannot be exceeded by any of that celebrated family. It is a perennial plant, sending up many nearly erect stems, from the root or source, these divide themselves into many ascendant slender rods like branches, which are ornamented with double pinnated leaves, of a most delicate formation. The compound flowers are of a pale, greenish yellow, collected together in a small oblong head, upon a long slender peduncle, the legumes are large, lunated and flat, placed in a spiral or contorted manner, each containing several hard compressed seed, or little beans." The Rigolets, St. Tammany Parish, Louisiana. = *Neptunia lutea* (Leavenw.) Benth.

Myrica †inodora Bartr., Trav. 405. 1791; ed. 2, 403. 1792.

"I observed many curious vegetable productions, particularly a species of Myrica (Myrica inodora) this very beautiful evergreen shrub, which the French inhabitants call Wax tree, grows in wet sandy ground about the edges of swamps, it rises erect nine or ten feet, dividing itself into a multitude of nearly erect branches, which are garnished with many shining deep green entire leaves of a lanciolate figure; the branches produce abundance of large round berries, nearly the size of bird cherries, which are covered with a scale or coat of white wax; no part of this plant possesses any degree of fragrance. It is in high estimation with the inhabitants for the production of wax candles, for which purpose it answers equally well with bees-wax, or preferable, as it is harder and more lasting in burning." Upper Tensaw River, near Hall's Creek, Baldwin County, Alabama. The Index Kewensis entry is "Bartr. Trav. ed. II. (1794) 403." It is a valid and accepted species. Small makes it *Cerothamnus inodorus* (Bartr.) Small, Man. Southeast. Flora 409. 1933. As Dr. Rickett notes, apparently Chapman, Fl. Southern U. S. 427. 1860, was the first post-Bartram author to recognize this species.

---

[5] This was from the Tensaw River, Alabama, above Mobile, in the low coastal region and so cannot be the same as *M. fraseri* Walt. (*M. auriculata* Bartr.), which is a mountain species. It is *M. macrophylla* Michx., as is also the entry on page 402.

Nyssa †coccinea Bartr., Trav. 17. *descr.*, 24. *nom.*, 1791; ed. 2, 17, 24. 1792.

"I saw large, tall trees of the Nyssa coccinea, si. Ogeeche, growing on the banks of the river. They grow in the water near the shore. There is no tree that exhibits a more desirable appearance than this, in the autumn, when their fruit is ripe, and the tree divested of its leaves; for then they look as red as scarlet, with their fruit, which is of that colour also. It is of the shape, but larger than the olive, containing an agreeable acid juice. The leaves are oblong lanciolate and entire, somewhat hoary underneath; their upper surface is of a full green, and shining; the petioles short, pedunculis multifloris. The most northern settlement of this tree, yet known, is on the Great Ogeeche, where they are called Ogeeche limes, from their acid fruit being about the size of limes, and their being sometimes used in their stead." Alatamaha River, at Fort Barrington, McIntosh County, Georgia. The Index Kewensis entry is "Bartr. Trav. ed. II. (1794) 17." = *Nyssa ogeche* Bartr. ex Marsh., Arbust. Am. 97. 1785.

Nyssa *ogeeche Bartr. ll. cc., *nom. alt. N. coccinea* Bartr. = *N. ogeche* Bartr. ex Marsh., Arbust. Am. 97, 1785.

Oenothera *grandiflora Bartr., Trav. 406. 1791; ed. 2, 404. 1792.

"Early one morning, passing along by some old uncultivated fields, a few miles above Taensa, I was struck with surprise at the appearance of a blooming plant, gilded with the richest golden yellow, stepping on shore, I discovered it to be a new species of the Oenothera (Oenothera grandiflora) Caule erecto, ramoso, piloso, 7, 8-pedali, foliis semi-amplexicaulibus lanceolatis, serrato-dentatis, floribus magnis, fulgidis, sessilibus, capsulis cylindricis, 4 angulis, perhaps the most pompous and brilliant plant yet known to exist. It is an annual or biennial, rising erect seven or eight feet, branching on all sides from near the earth upwards, the lower branches extensive, and the succeeding gradually shorter to the top of the plant, forming a pyramid in figure; the leaves are of a broad lanceolate shape, dentated or deeply serrated, terminating with a slender point, and of a deep full green colour; the large expanded flowers, that so ornament this plant, are of a splendid perfect yellow colour; but when they contract again, before they drop off, the underside of the petals next the calyx becomes a reddish flesh colour, inclining to vermillion, the flowers begin to open in the evening, are fully expanded during the night, and are in their beauty next morning, but close and wither before noon. There is a daily profuse succession for many weeks, and one single plant at the same instant presents to view many hundred flowers. I have measured these flowers above five inches in diameter, they have an agreeable scent." Upper Tensaw River, Baldwin County, Alabama = ? *Oenothera grandiflora* Aiton (1789).

Antedating *Oenothera grandiflora* Bartr. by two years is *O. grandiflora* Ait., Hort. Kew. **2**: 2. 1789, Aiton's very brief description having been based on specimens grown in England, one of Dr. Fothergill's introductions from North America through William Bartram, the seeds doubtless received under Bartram's name, and from the plants that he actually observed. Aiton's reference to "L'Hérit. Stirp. Nov. Tom. 2 Tab. 4" is apparently to an unpublished illustration of L'Héritier that was available to Solander; this part of L'Héritier's work was never published.

Panicum *hirtellum Bartr., Trav. 430. 1791; ed. 2, 428. 1792; non Linn., nec Burm. f.

"In one corner of the garden was a pond, round about which [430] grew luxuriantly the Scotch grass (Panicum hirtellum, gramen panicum maximum, spica divisa, aristis armatum, Sloan, Jam. Cat. 30) the people introduced this valuable grass from the West-India islands;

they mow or reap it at anytime, and feed it green to cows and horses; it is nourishing food for all cattle." The entry in Sloane, Cat. 30. 1696, repeated also in his Voyage **1**: 106. 1707, is "Gramen paniceum maximum, spica divisa aristis armatum," a pre-Linnaean descriptive sentence. Bartram, however, deliberately provided it with a binomial, *Panicum hirtellum* Bartr. Between Manchac and Baton Rouge, on the banks of the Mississippi River in Louisiana = *Echinochloa* sp.

Prunus *caroliniana Bartr., Trav. 187, *descr.*, 198, *nom.*, *nota*, 1791; ed. 2, 185, 196. 1792.

"Prunus Caroliniana (pr. flor. racemosis, foliis sempervirentibus, lato-lanceolatis, accumunatis, serratis)." The note on p. 198 is: "Prunus caroliniana, a most beautiful evergreen, decorated with its racemes of sweet, white blossoms." South side of Alachua Savanna, Alachua County, Florida. Bartram, who seldom cited authorities for binomials, may have intended this to be merely a characterization of Aiton's species, although considering the dates involved this is improbable. = *Prunus caroliniana* (Mill.) Ait., Hort. Kew. **2**: 163. 1789 (*Laurocerasus caroliniana* M. Roem., *Padus caroliniana* Mill.).

Prunus *nemoralis Bartr., Trav. 408. 1791; ed. 2, 406. 1792.

"Prunus nemoralis, floribus racemosis foliis sempervirentibus, nitidis." Upper Tensaw River, Baldwin County, Alabama = *praec.* fide Fernald in Rhodora **46**: 45. 1944.

Quercus *incana Bartr., Trav. 378, *descr.*, 403, *nom.* 1791; ed. 2, 376, 401. 1792.

"Quercus incana, foliis ovalibus integerrimis subtus incanis." High ridges, Warren County, Georgia; see F. Harper in Bartonia **22**: 3. 1943, and Fernald in Rhodora **46**: 44. 1944, who accepted Bartram's binomial, reducing *Quercus cinerea* Michx. (1803) to synonymy.

Quercus *maritima Bartr., Trav. 164. 1791; ed. 2, 162. 1792.

"Quercus maritima, foliis obcunciformibus obsolete trilobis minoribus." Near Salt Springs, west side of Lake George, Marion County, Florida. A species of doubtful status; see Fernald in Rhodora 46: 45. 1944. Dr. F. Harper, *in litt.*, thinks that it is either *Q. myrtifolia* Willd. (1805) or *Q. chapmani* Sarg. (1895).

Quercus *tinctoria Bartr., Trav. xvi, *nom.*, 28, *nom.*, *nota*, 36, *nom.*, 37, *nom.*, *nota*, 320, *nom.*, 335, *nom.*, 362, *nom.*, 378, *nom.*, 394, *nom.*, 474, *nom.* 1791; ed. 2, xi, 28, 36, 37, 318, 333, 360, 376, 392, 472, 1792.

On page 28 the entry is "4. Q. tinctoria . . . Great Black Oak." On p. 37 "the gigantic Black * Oak (Q. tinctoria)." Georgia = *Quercus velutina* Lam. (1785).

> * "Gigantic Black Oak. Querc. tinctoria; the bark of this species of oak is found to afford a valuable yellow dye. The tree is known by the name of Black Oak in Pennsylvania, New-Jersey, New-York, and New England."

Sarracenia †lacunosa Bartr., Trav. xviii, *nom.*, 417, *descr.*, 1791; ed. 2, xii, 415. 1792 (*Saracinia*).

"And in the level wet savannas grew plentifully a new and very elegant species of Saracenia (Saracinia lacunosa) the leaves of this plant, which are twelve or fourteen inches in length, stand nearly erect, are round, tubular and ventricose; but not ridged with longitudinal angles or prominent nerves, as the leaves of Saracinia flava are; the aperture at the top may be shut up by a cap or lid, of a helmet form, which is an appendage of the leaf, turning over the orifice in that singular manner, the ventricose, or inflated part of the leaf, which is of a pale, but vivid green colour, is beautifully ornamented with rose coloured studs or blisters, and the inner surface curiously inscribed, or variegated with crimson veins or fibres. It was past the time for flowering, but the plant in any situation is a great curiosity." Near Pensacola, Florida. The entry in Index Kewensis is "Bartr. Trav. ed. II (1794), p. xii. 415."

Macfarlane, in Das Pflanzenreich **34** (IV. 110): 31. 1908, placed Bartram's species unequivocally in the synonymy of *S. drummondii* Croom, in Ann. Lyc. Nat. Hist. N. Y. **4**: 100. 1848 [1837], together with *S. leucophylla* Raf. Fl. Ludovic. 14. 1817; the latter was based on a cursory Robin description of what he took to be an aroid, and there is no reasonable doubt regarding the identity of the Croom and Rafinesque species. *S. drummondii* Croom (1837) = *S. leucophylla* Raf. (1817) is abundant in the neighborhood of Pensacola, and this is undoubtedly the species that Bartram observed. But, according to Small, Man. Southeast Fl. 582. 1933, sub *S. drummondii*, Bartram's *description* is of *S. minor* Walt., an opinion confirmed by Dr. F. Harper, *in litt.*

Stewartia *montana Bartr., Trav. 334. 1791; ed. 2, 332. 1792.

"Stewartia montana *, fol. ovatis acuminatis serratis, flor. nivea, staminum corona fulgida, pericarp, pomum exsuccum, apice acuminato dehiscens." Oconee County, South Carolina. The entry in Index Kewensis is *Stuartia montana*, Bart. Trav. ed. II. (1794 [1792]) 332, *Stuartia* being the accepted spelling of the generic name. Bartram's species seems clearly to be the same as *Stuartia pentagyna* L'Hérit., Stirp. Nov. 155. *t. 74.* 1791. Small retains *Malachodendron* Cav. as generically distinct from *Stuartia* Linn., and makes the species *Malachodendron pentagynum* (L'Hérit.) Small. The oldest name for this species is *Stuartia ovata* (Cav.) Weatherby (*Malachodendron ovatum* Cav., 1788).

"* This is a new species of Stewartia, unknown to the European botanists, and not mentioned in any catalogues."

Stillingia *fruticosa Bartr., Trav. 476. 1791; ed. 2, 474. 1792. ("*S. fructicosa*").

"Stillingia fructicosa, foliis lanciolatis, utrinque glabris, fructu tricocco." Ashwood, about five miles northeast of Council, Bladen County, on Northwest Cape River, North Carolina. = *Sebastiania fruticosa* (Bartr.) Fernald in Rhodora **46**: 45. 1944. (*Stillingia ligustrina* Michx., *S. fruticosa* Michx. ex Spreng., *S. frutescens* Bosc ex Steud., *Ditrysinia ligustrina* Raf., *Gymnanthes ligustrina* Muell.-Arg.).

Tillandsia *lingulata Bartr., Trav. 61, 1791; ed. 2, 59. 1792; non Linn.

"Till[andsia] lingulata or Wild Pine; both of these curious vegetables [T. monostachya and T. lingulata] are parasites, living on the substance of others, particularly on the limbs of Live Oak; the latter species is a very large flourishing plant, greatly resembling at some distance, a well grown plant of the Bromelia Ananas: the large deep green leaves are placed in an imbricated order, and ascendant; but their extremities are reflex, their bases gibbous and hollowed like a ladle, and capable of containing near a pint of water; heavy tempests of wind and rain tear these plants from the trees; yet they live and flourish on the earth, under the shadow of these great Live Oaks." St. Simons Island, Georgia. = *Tillandsia utriculata* Linn.

Vitis *campestris Bartr., Trav. 400. 1791; ed. 2, 398. 1792.

"During our progress over this vast high forest, we crossed extensive open plains, the soil gravelly, producing few trees and shrubs or undergrowth, which were entangled with Grape vines (Vitis campestris) of a peculiar species; the bunches (racemes) of fruit were very large, as were the grapes that composed them, though yet green and not fully grown, but when ripe are of various colours, and their juice sweet and rich. The Indians gather great quantities of them, which they prepare for keeping, by first sweating them on hurdles over a gentle fire, and afterwards dry them on their bunches in the sun and air, and store them up for provisions: these Grape vines do not climb into high trees, but creep along from one low shrub to another, extending their branches to a great distance horizontally round about, and it is very pleasing to behold the clusters pendant from the vines, almost touching the earth, indeed some of them lie upon the ground." Butler or an adjacent County, Alabama. Accepted by Fernald in Rhodora **46**: 48. 1944, as the valid name for what has long been known as *Vitis rotundifolia* Michx. (1803) (*Muscadinia rotundifolia* Small) but Dr. Francis Harper, on the authority of Bayard Long, thinks that it may prove to be *Vitis labrusca* Linn., considering that further field work in the place where Bartram observed the species would be desirable.

PTERIDOPHYTA

Felix [Filix] *scandens Bartr., Trav. 41. 1791; ed. 2, 41. 1792 (*Filix*).

"Felix scandens, perhaps species of Trichomanes; the leaves are palmated, or radiated; it climbs and roves about, on shrubs, in moist grounds." Oglethorpe County, Georgia. =*Lygodium palmatum* (Bernh.) Sw.

Filex [Filix] *osmunda Bartr., Trav. 173. 1791; ed. 2, 171. 1792 (*Filix*).

"and here were great quantities of a very large and beautiful Filex osmunda, growing in great tufts or clumps." Deep Creek, Putnam County, Florida. Here one might assume that it was not Bartram's intent to publish a binomial, for he perhaps merely intended to indicate "the large fern, Osmunda." Being strictly a *nomen nudum* Bartram's binomial has no standing.

Pteris *scandens Bartr., Trav. 478. 1791; ed. 2, 476. 1792.

"Observed near Cambelton a very curious scandent Fern (Pteris scandens) rambling over low bushes, in humid situations, the lower larger fronds were digitated or rather radiated, but towards the tops or extremities of the branches, they became trifid, hastated, and lastly lanciolate; it is a delicate plant, of a yellowish lively green, and would be an ornament in a garden." Near Fayetteville, Cumberland County, North Carolina. = *Lygodium palmatum* (Bernh.) Sw.

BARTRAM'S NOMINA NUDA

In addition to the various species that Bartram named and characterized, either with technical or cursory descriptions, or by notes, he also proposed a very considerable number of new binomials accompanied by no descriptive data. There is little to be gained by even listing these, although a very few of them were entered in Index Kewensis. Not being accompanied by descriptive data, and with no cross references to descriptions elsewhere, they are strictly *nomina nuda* and have no standing. In the following condensed list those names marked with an asterisk (*) are not listed in Index Kewensis; those indicated by the sign (†) are entered, but the citations are erroneous in one respect or another. The list of these *nomina nuda*, with references to the 1791 edition of Bartram's Travels only, is as follows:

*Aesculus *alba* Bartr. 401, 408; *A. *arborea* Bartr. 36; *A. *parva* Bartr. 7 (an *A. pavia* Linn.?); *Andromeda *viridis* Bartr. 303; *Annona *alba* Bartr. 303; *A. *incana* Bartr. v; *Arethusa *pulcherima* Bartr. xviii; *Asclepias *carnosa* Bartr. 342; *A. *coccinea* Bartr. 472; *A. *fragrans* Bartr. 19; *Aster *fruticosus* Bartr. ix, 470; *Azalea *coccinea* Bartr.[6] xvi, xvii,

---

[6] It is suspected that the binomials *Azalea coccinea, A. flammea*, and *A. flammula* actually appertain to the species extensively discussed but there not named, by Bartram, Trav. 322-323. 1791: "In these cool, sequestered, rocky vales, we behold . . . [the] fiery Azalea flaming on the ascending hills or wavy surface of the gliding brooks. The epithet fiery, I annex to this most celebrated species of Azalea, as being expressive of the appearance of it in flower, which are in general the colour of the finest red lead, orange and bright gold, as

319; *A.* **flammea* Bartr. 327; *A.* **flammula* Bartr. 342; *A.* **nuda* Bartr. 29; *A.* **rosea* Bartr. xvi; **Callicanthus* **floridus* Bartr. 318, sphalm. = *Calycanthus floridus* Linn.; *Cassine* **yapon* Bartr. 476; *Chironia* **pulcherrima* Bartr. 19; *Citrus* **limon* Bartr. 461; *C.* **verrucosa* Bartr. 461; *Corypha* **palma* Bartr. 6, 29, 61, 93, 114, 131, 187, 222, "Great Cabbage Palm" = *Corypha palmetto* Walt. = *Sabal palmetto* (Walt.) Lodd.; *Crinum* **floridanum* Bartr. xvii; *Diospyros* **virginica* Bartr. 131, sphalm. = *D. virginiana* Linn.; *Erythronium* **maculatum* Bartr. 342; *Filex* [*Filix*] **osmunda* Bartr. 173 (see p. 33); *Franklinia* **alatahama* Bartr. 16, sphalm. = *F. alatamaha* Bartr. ex Marsh.; *Fraxinus* **aquatica* Bartr. 6, 24, 130; *Gentiana* **caerulea* Bartr. 472; *Hydrocotyle* **fluitans* Bartr. 130; *Juglans* **acuminata* Bartr. 32; *J.* **exaltata* Bartr. 29, 32, 36, 37, 38, 309, 399, 432; *J.* **hiccory* Bartr. 90; *J.* **hickory* Bartr. 320, 327, 335, 362, 374, 378, 494; *J.* **rustica* Bartr. 309; *Juniperus* **americana* Bartr. 6, 298, 325, 421; *Kalmia* **spuria* Bartr. 303; (sphalm. "Halmea", ed. 2, 301. 1792 as *Kalmia spuria*); *Lupinus* **filifolius* Bartr. 243; *Malva* **scandens* Bartr. 41; *Nyssa* **tupilo* Bartr. 93; *Ophrys* **insectoria* Bartr. xviii, sphalm. = *O. insectifera* Linn.; *Panax* **ginseng* Bartr. 362; *Pancratium* **fluitans* Bartr. 35; *Pavia* **sylvatica* Bartr. 44 (*Aesculus sylvatica* Bartr.); *Persicaria* **amphibia* Bartr. 130; *Pinus* **balsamica* Bartr. xvi, sphalm. = *P. balsamea* Linn.; *P.* **phoenix* Bartr. xvi; *P.* **squamosa* Bartr. 6 (an *P. squarrosa* Walt.?); *Prunus* **chicasaw* Bartr.[7] 38, 50; *P.* **indica* Bartr. 320, 398, 400; *Quercus* **castania* Bartr. 36; *Q.* †*dentata* Bartr. 6, 10, 24, 28, 84, 131, 161, 204, 320 (Ind. Kew. "ed. II (1794) 28"); *Q.* **flammula* Bartr. 209 ("flammule"), 403, 470; *Q.* **glandifer* Bartr. 164; *Q.* †*hemispherica* Bartr. xv, 309, 320, 394, 421, 426, 474 (Ind. Kew. "Bartr. Trav. 320"); *Q.* **laciniata* Bartr. 36, ut "lasciniata"; *Q.* **lobata* Bartr. 320, 378, 394; *Q.* †*tinctoria* Bartr. xvi, 28, 32, 36, 37, 309, 320, 335, 362, 378, 394, 494 (Ind. Kew. "Bartr. Trav. ed. II. (1794) 37; Michx. Hist. Chênes Am. ii, 24, 25"); *Rhexia* **pulcherima* Bartr. 472; *Rhododendron* **spurium* Bartr. v; *Robinia* †*montana* Bartr.[8] 342 (Ind. Kew. "Bartr. Cat. ex Pursh Fl. Am. Sept. ii. 488");

---

well as yellow and cream colour; these various splendid colours are not only in separate plants, but frequently all the varieties and shades are seen in separate branches on the same plant, and the clusters of the blossoms cover the shrubs in such incredible profusion on the hill sides, that suddenly opening to view from dark shades, we are alarmed with the apprehension of the hills being set on fire. This is certainly the most gay and brilliant flowering shrub yet known: they grow in little copses or clumps, in open forests as well as dark groves, with other shrubs, and about the bases of hills, especially where brooks and rivulets wind about them; the bushes seldom rise above six or seven feet in height, and generally but three, four or five, but branch and spread their tops greatly; the young leaves are but very small whilst the shrubs are in bloom, from which circumstance the plant exhibits a greater shew of splendour." Between Little and Broad Rivers, Georgia. This should be *Azalea calendulacea* Michx. = *Rhododendron calendulaceum* (Michx.) Torr., although *A. speciosa* Willd. = *Rhododendron speciosum* (Willd.) Sweet may be involved. In fact Rehder and Wilson, Monog. Azalea 127. 1921, cite *A. flammea* Bartr. in the synonymy of *Rhododendron calendulaceum* (Michx.) Torr. Dr. Wherry thinks that the description applies to *R. speciosum* (Willd.) Sweet.

[7] Bartram's footnote on p. 38 is: "The Chicasaw plumb I think must be excepted, for though certainly a native of America, yet I never saw it wild in the forests but always in old deserted Indian plantations: I suppose it to have been brought from the S.W. beyond the Mississippi by the Chicasaws." This is *Prunus chicasa* Michx. (1803) = *P. angustifolia* Marsh. (1785).

[8] On page 335 the following description, without a binomial, appears: "a species of Robinia new to me, though perhaps the same as figured and slightly described by Catesby in his Nat. Hist. Carol. This beautiful flowering tree grows twenty to thirty feet high, with a crooked leaning trunk, the branches spread greatly, some almost touching the ground; however there appears a singular pleasing wildness and freedom in its manner of growth, the slender subdivisions of the branches terminate with heavy compound panicles of rose or pink coloured flowers, amidst a wreath of beautiful pinnated leaves." On page 336 there is a reference to the "incarnate Robinia." There are no references to *Robinia montana* Bartr. Near Oconee Station, Oconee River, South Carolina. This is *Robinia viscosa* Vent. (1800).

Rosa paniculata Bartr. 334, 342; *Ruellia *infundibuliformis* Bartr. 224 ut "infundibuliformea"; *Salix *fluvialis* Bartr. 393; *Salvia *graveolens* Bartr. 181, 183, ut "graviolens"; *Sarracenia *galeata* Bartr. xviii; *Staphylea *trifoliata* Bartr. 321 (*S. trifolia* Linn.); *Styrax *latifolius* Bartr. 32; **Telea* Bartr. 399, 421, 432, 436, 474 (*Ptelea* Linn.); *Tillandsia †monostachya* Bartr. 61 (Ind. Kew. "Bartr. Trav. ed. II (1794) 59"); *Ulmus *suberifera* Bartr. 131 ut "suberifer", 309 ut "subifer", 393; *U. *sylvatica* Bartr. 37, 130, 187, 320; *Verbena *corymbosa* Bartr. 155, 173; *Viburnum *canadense* Bartr. xviii. 77; *Vitis *allobrogica* Bartr. 460; *V. *corinthiaca* Bartr. 460; *Zizyphus *scandens* Bartr. 87. Also *Aesculus *virginica* Bartr. Trav. xvi, which may not be the same as *A. virginiana* Bartr.

One wonders about some of these binomials, such as *Panax ginseng* Bartr., *Vitis allobrogica* Bartr. and *V. corinthiaca* Bartr. May not Bartram have actually seen them in some publication familiar to him that was overlooked by those bibliographers concerned with compiling indices to the original places of publication of binomials? However, I find no references to these names in botanical literature previous to 1791. *Panax ginseng* C. A. Mey. was published in 1843.

ADDENDUM

About a week before I received the final proofs of this paper Professor M. L. Fernald called my attention to edition 8 of "The Gardener's Dictionary" by Philip Miller (1768), the edition in which he changed his entries to the binomial system. He was distinctly inconsistent, for while most of the plant names are binomials, there are a considerable number of monomials and a distinctly large number of descriptive phrases. Thus in the entries under the letter A, with about 560 binomials, there are eighteen polynomials in the form of pre-Linnaean descriptive sentences. Examples are "Alchemilla foliis lobatis sericeis acutis" (4 binomials under *Alchemilla*); "Aloe foliis erectis subulatis radicatis undique inerme spinosis" (22 binomials under *Aloe*); and "Asparagus caule herbaceo erecto, foliis setaceis . . ." (9 binomials under *Asparagus*). I merely cite this standard work, which all taxonomists accept as a source of both generic and specific names, as supporting my contention that Bartram's botanical names should be accepted. Certainly if Bartram's "Travels" be eliminated, so logically should all the names in Miller's edition of 1768 be discarded, for he was more inconsistent than was Bartram. His intention was clear, in that he accepted the binomial system even if, in a certain percentage of cases he also included cumbersome pre-Linnaean descriptive sentences as the names for certain species that he recognized.

Notes on North American Campanulaceae

Rogers McVaugh

1. The Genus Asyneuma in the North American Flora

The Californian species which has hitherto passed as *Campanula prenanthoides* Durand [1] is certainly to be referred to *Asyneuma* Griseb. & Schenk,[2] and may be designated as *Asyneuma* **prenanthoides** (Durand) McVaugh, comb. nov. *Asyneuma* is a genus of about 40 species, mostly natives of Asia Minor and southeastern Europe, separated from *Campanula* chiefly by the deeply divided corolla with tardily separating lobes, and from *Phyteuma* by the narrowly paniculate (rather than capitate or spicate) inflorescence. Its generic position is none too strong, but it comprises a reasonably homogeneous group, and its reduction either to *Campanula* or to *Phyteuma* would materially lessen the distinction between these. It has been accepted as a valid genus by most modern European workers; it was long known as *Podanthum* (G. Don) Bois., until Grisebach's name was taken up under modern rules of nomenclature.[3] One of the few Far Eastern species of the genus, *A. japonicum* (Miq.) Briq., is very similar to *A. prenanthoides* in its gross morphology.

2. The Genus Wahlenbergia in the North American Flora.

In 1939 plants of the genus *Wahlenbergia* were collected by Mr. Erdman West from fence rows and along ditches on the grounds of the Agricultural Experiment Station at Gainesville, Florida, where it had been established as a weed for " several years ". The same species was collected in Washington County, Florida, the same year, by the late Mary F. Baker; in 1940 it was collected in Wheeler County, Georgia, by Mr. Don E. Eyles, and also near Lyons, Toombs County, Georgia, by the writer. At the Lyons locality it was well established as a weed in dry sand of road embankments. All the above collections (now represented by specimens in the Herbarium of the National Arboretum) appear unquestionably to represent the same species, probably *Wahlenbergia marginata* (Thunb.) A.DC., a native of the tropics and subtropics of the Old World, here reported for the first time from North America.

The identification of this species as *Wahlenbergia marginata* is made after comparison with herbarium material of what is evidently the same entity. Most specimens of this have been identified as *Wahlenbergia gracilis* (Forst.) A.DC., but that appears to be a later name for the same plant. The two supposed species were united by Matsumura[4] under the name of *W. gracilis*, and by Koorders[5] under the name of *W. marginata*, and even Alphonse DeCandolle, who maintained the two as distinct, noted[6] that the differences between them were minor ones. N. E. Brown[7] has published a description of the type specimen of *Campanula gracilis* Forst., which seems to fit the American plants mentioned above, and these plants appear also to represent the species portrayed in Thunberg's original plate of *Campanula marginata*.[8]

---

[1] Jour. Acad. Nat. Sci. Phila. ser. 2, 3: 93. 1855.

[2] Archiv für Naturgesch. 18(1): 335. 1852.

[3] For a synopsis of the known species, see Bornmüller, J., in Beih. Bot. Centralbl. 38: 333-351. 1921. For treatments of the Near Eastern species, see Boissier, E., Fl. Or. 3: 945-957. 1875, and Fomin, A., Flora caucasica critica 4(6): 129-139. 1906.

3. Campanula lasiocarpa Cham., in the United States

This species was collected by J. William Thompson (no. 14697) in 1940, at the base of Big Four Mountain, Snohomish County, Washington, at an elevation of 2500 feet. *Campanula lasiocarpa* is prominent in the Alaskan flora, and is well known in the Canadian Rockies, but it has not, to my knowledge, been reported from near or within the borders of the United States.

4. An Unusual Form of Campanula americana L.

In 1937 Dr. Donovan S. Correll collected on Warnock Peak, Blount County, Alabama, a diffusely branched *Campanula* (his no. 8285) of small stature (plants up to about 30 cm. high), which bore its long-peduncled flowers in lax racemoid arrangement on all the branches. The plants seemed utterly unlike any known American *Campanula*, until examination showed that the flowers were identical in every respect (except that they were slightly smaller) with the flowers of *Campanula americana*, a native of the same region. *Campanula americana*, however, is a tall and usually unbranched plant, often 1-1.5 m. high, with sessile flowers in a rather dense terminal spike. Even relatively glabrous individuals of *C. americana*, moreover, retain numerous chaffy hairs on the upper surfaces of the leaves, at the tips of the corolla lobes, and along the angles of the stem, while the plants from Warnock Peak were almost entirely glabrous in these places. The leaves of the latter were smaller and more abruptly pointed than those of *C. americana*, and were all more or less petiolate and often subtruncate at base rather than merely attenuate or rounded.

Examination of a large series of specimens of *Campanula americana* brought to light nothing exactly like the plants collected by Dr. Correll, but occasional herbarium specimens which had been stunted or broken off were found to have produced abnormal or weak shoots; such shoots, in the few cases in which the careful collectors of " normal " plants had given them herbarium room, usually bore smaller leaves than those usual for the species, with longer petioles and round and even truncate bases. A single fragment with pedunculate flowers was found. From these it was but a step to confirm what had been but casually noted before, that the small and diffuse plants from Warnock Peak had all been cropped—presumably by deer—within a few inches of the ground; some of them had been browsed repeatedly. Evidently the unknown "new species" had been produced as a result of such browsing on once normal plants of *Campanula americana.*

---

[4] Ind. Pl. Jap. 2: 618. 1912.

[5] Exkursionsfl. Java 3: 300. 1912.

[6] Monog. Campan. 144. 1830.

[7] Gard. Chron. ser. 3, 54: 317. 1913.

[8] Pl. Jap. Ic. dec. 3.

The apparently fundamental difference between the inflorescence of *Campanula americana* and that of this form is actually no more than what should

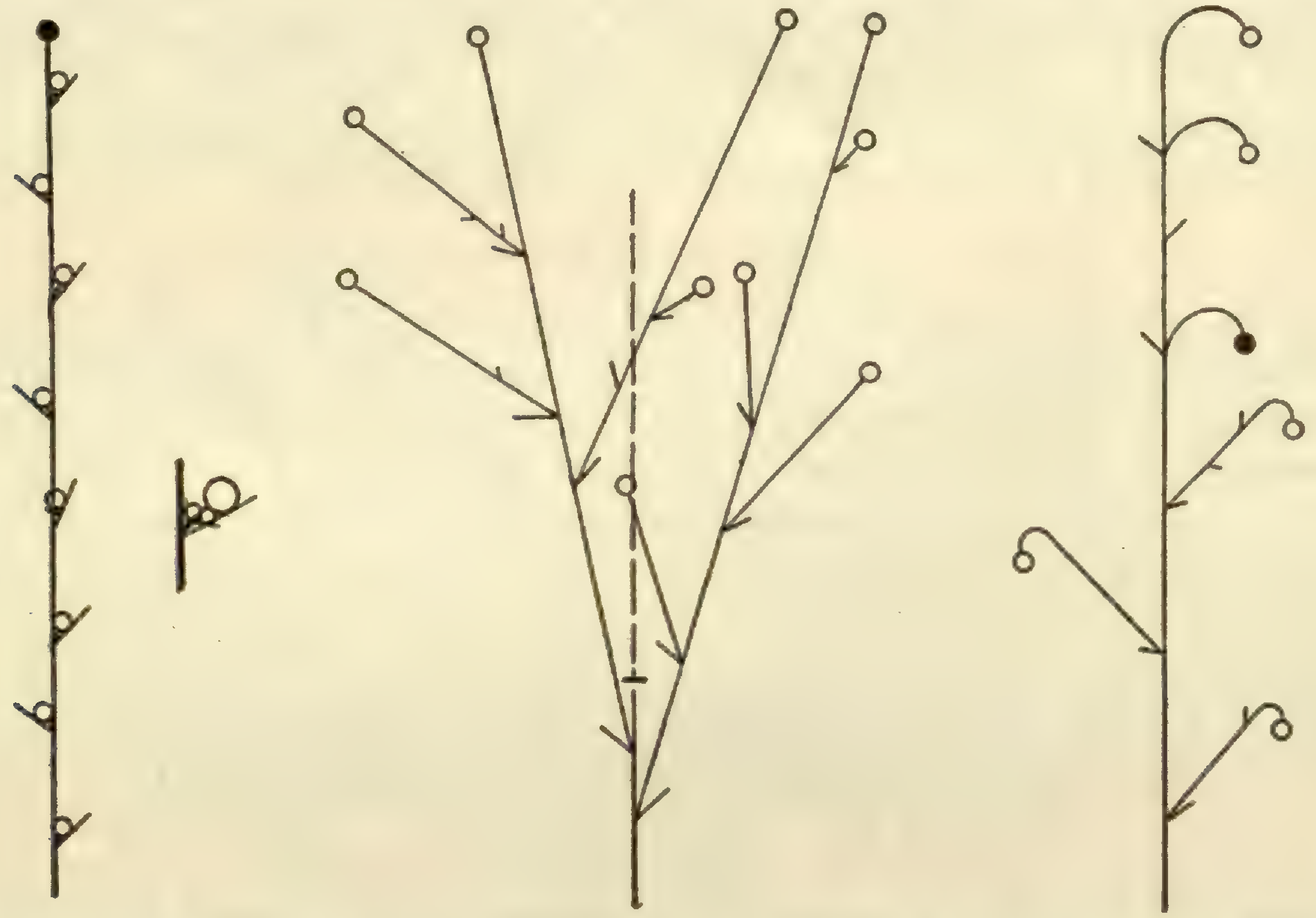


Figure 1. Homologous inflorescence types in Campanulas; left to right, *Campanula americana* L. (normal), *Campanula americana* (primary axis interrupted), *Campanula rotundifolia* L. (vigorous normal individual). Terminal flowers of the primary axes are in solid black. One of the flowering branches of a normal plant of *C. americana* is shown enlarged. Note that the lateral flowers of the branch are represented in the abnormal (cropped) plant by bracts only, the flowers themselves aborting. Similar axillary branches bearing bracts and a terminal flower occur regularly in *C. rotundifolia,* but in this species the terminal flower is often displaced so as to appear lateral, and the primary axis may be surpassed by the upper axillary branch.

be expected as a response to clipping which stops growth of the principal stem-axis. Lateral axes, which normally give rise in this species to what are apparently clusters of sessile flowers, are stimulated to abnormal elongation; identical phenomena are observed by every gardener who clips his plants to make them bushy. As a result of this, clusters of sessile flowers are replaced by single pedunculate flowers with abortive remnants of other flowers at the bases of the peduncles. The accompanying diagram shows the floral arrangement in normal and abnormal *Campanula americana,* and the homologous arrangement in another species, *Campanula rotundifolia* L.

The reduced amount of pubescence found on the cropped plants is probably also a direct result of the cropping; exactly similar results are produced elsewhere in the Campanulaceae. A striking example is found in *Lobelia puberula,* which is normally thickly pubescent, but which after cropping usually develops glabrous or nearly glabrous branches; many of the glabrous specimens from the Gulf Coastal Plain of the United States, which have been identified as *L. puberula laeviuscula* Mohr, prove upon examination to have been normally pubescent plants which have been broken off just above the base and have subsequently produced the glabrous branches.

5. Lobelia berlandieri and Lobelia brachypoda.

Lobelia berlandieri A.DC. was based on a specimen (*Berlandier 106*) collected near Tampico, Tamaulipas. This specimen, a type common in the coastal area between Matamoros and Tampico, is representative of a population having decumbent stems, relatively long and spreading pedicels, a rosette of basal leaves present at flowering time, and but few cauline leaves. A photograph of the type, kindly furnished by Professor Hochreutiner, makes clear these points. All plants so far examined from this area have eciliate calyx-lobes; so, presumably, has the type of *L. berlandieri,* but this cannot be ascertained from the photograph.

Lobelia brachypoda Small, as defined in the *North American Flora,*[9] is a taller, more erect plant with cauline leaves and usually with no basal rosette; the pedicels are shorter and more nearly erect than in *L. berlandieri,* and the calyx-lobes are ciliate.

In the lowlands of Tamaulipas and northern Veracruz *Lobelia berlandieri* is the prevailing plant of this affinity, while in southern and southwestern Texas *L. brachypoda* predominates. In southern coastal Texas, where the ranges of the two coincide, there are numerous intermediate plants which exhibit various combinations of the features supposed to distinguish the species, and I am quite unable to refer these intermediates definitely to one species or the other. In 1940 I had seen few such intermediate plants, and their relation to the general population was not clear. Because of the apparently ample distinctions between the extremes (typical *berlandieri* and *brachypoda*) I maintained the two plants as distinct species at that time[10] and in the *North American Flora.* Recently, however, I have had access to additional specimens from southern Texas, and it appears that the number of intermediates is proportionately high and that there is no good distinction between *L. berlandieri* and *L. brachypoda.* Evidently the two are but geographically segregated races of the same species, and should be designated as follows:

---

[9] N. Am. Fl. 32A: 50-52. 1943.

[10] Am. Midl. Nat. 24: 690-692. 1940.

Lobelia berlandieri A.DC., var. **berlandieri** McVaugh, nom. nov. *Lobelia berlandieri* A.DC. in DC. Prodr. 7(2): 367, as to type. 1839; McVaugh in North Am. Fl. 32A: 50. 1943. A map of the distribution of this variety and the following and a list of representative specimens, appeared in the American Midland Naturalist for November, 1940.

Lobelia berlandieri A.DC., var. **brachypoda** (A. Gray) McVaugh, comb. nov. *Lobelia cliffortiana* var. *brachypoda* A. Gray, Syn. Fl. N. Am. 2(1): 7. 1878. *Lobelia brachypoda* "A. DC." ex Small, Fl. SE. U. S. 1147. 1903; McVaugh in North Am. Fl. 32A: 51. 1943.

The type of this variety is Charles Wright's no. 419, collected on Elm Creek, Texas, in October, 1849. Gray's original description stressed the short pedicels ("2 or at most 3 lines long"), and was based on "*L. Berlandieri*, Torr. Mex. Bound. 107, hardly of A.DC.—S. W. Texas, *Wright, Parry*. Adjacent parts of Mexico, *Berlandier*, &c." Gray apparently excluded from var. *brachypoda* Berlandier's no. 3177, which he said "may be *L. Berlandieri*", and which was said by him to have long filiform pedicels. In the report on the Mexican Boundary Survey Torrey cited Berlandier's no. 3177, and also Wright's nos. 419 and 1429. Gray, as shown by sheets now in the Gray Herbarium, had access to these collections of Wright's and apparently one of them should be selected as the type of the variety. The Parry collection cited by Gray I have not located, unless he referred to no. 693 of the Mexican Boundary Survey, from the "banks of the Sabinal", of which there is a sheet at New York. Of Wright's two collections I have taken no. 419 to be the type because it is representative of the variety as here defined and agrees well with Gray's description ("cauline leaves from obovate-spatulate to lanceolate"). Some of the sheets of Wright's no. 1429 are scarcely distinguishable from typical *Lobelia berlandieri*.

Division of Plant Exploration and Introduction
Plant Industry Station, Beltsville, Maryland

Will the Stowaway, *Molinia caerulea*, become Naturalized?

W. L. Dix

The chance collection of *Molinia caerulea* in the northern part of Wayne County, Pennsylvania, in the summer of 1943 remained unidentified until the locality was revisited in 1944 with Dr. Henry K. Svenson who recognized it immediately from its being a familiar sight to him on a trip into Scotland some years ago. This was the first collection in Pennsylvania since its discovery in 1878 by Isaac Burk in Philadelphia.

Molinia caerulea, or Purple Moor Grass as it is known in the British Isles, is a plant of bogs, marshes, and heathy places in its native land. It often occupies miles of heath almost to the exclusion of other grasses. In this respect it is like some of our Andropogons. Unlike the Andropogons, however, which light up our winter landscape with their russet foliage, the Purple Moor Grass has dark bluish leaves and dark purple spikes, and makes a prominent feature in the heath vegetation. In some fishing villages it is used in making ropes, and elsewhere its tall culms are utilized in the manufacture of a poor sort of broom.

In Europe the species has been divided into five or six varieties. A small form, v. *breviramosa*, is most frequently the heath form, and v. *major*, often four feet high, occurs in bogs and marshes. In the United States apparently no attempt has been made to indicate which variety grows here, or whether more than one variety occurs in this country.

In the locality where it has been found in Wayne County it covers an area of some acres with a rather extensive growth, not however to the exclusion of other grasses. It grows in large clumps with a *very tenacious* root, and almost defies any attempt to collect root material. The culms are from three to four feet high, and the panicle, though usually appressed with short ascending branches, often consists of lax spreading branches 5-7 inches long. It was this latter condition that prevented the writer from properly identifying it, as the manuals separate it from its associates by referring to " narrow panicle, with short appressed branches ".

It apparently made its first trip across the Atlantic as a stowaway, for the record of its first collection in the United States is as follows: " Ballast, Philadelphia, Penn., Aug., 1878, No. 2." Although this record is unsigned, the handwriting is that of Isaac Burk, in the opinion of Mrs. Agnes Chase of the United States National Museum, Washington, D. C. Another specimen bearing his name was collected at Kaighn's Point, Camden County, New Jersey, just across the Delaware River from Philadelphia. This last specimen is undated.

The next collection of Purple Moor Grass in the United States was by Dr. C. H. Peck, former state botanist of New York, in 1884 at Garoga, Fulton County, N. Y. How this plant found its way into this remote locality at the southern edge of the Adirondack plateau is something of a mystery. The only other collections here in the last century were three by E. P. Bicknell in 1897, at Bar Harbor, Mt. Desert, and York Harbor, all in Maine. Each bears the same date, August 25. Bar Harbor and Mt. Desert are both on Mt. Desert Island, but 150 miles from York Harbor.

At present it does not seem likely that the Purple Moor Grass will become sufficiently established to displace any of the usual meadow or pasture grasses in the United States. It apparently has not invaded our bogs and swamps, for it is recorded only from roadsides and uncultivated fields. In Wayne County it grows in an abandoned field formerly cultivated, and to all appearances it came there in some imported seed, as it is generally spread over a large area, but is limited to a single field. Inquiry at Michell's seed store in Philadelphia produced the information that it probably was introduced with English Perennial Rye Grass, *Lolium perenne*, which is imported here, and used extensively for lawns, meadows and pastures.

Its distribution in the United States, as indicated by herbarium specimens appears in the following account. Herbaria are indicated as follows: AS., The Academy of Natural Sciences in Philadelphia, Pa.; G. Gray Herbarium at Cambridge, Mass.; MBG. Missouri Botanical Garden, St. Louis, Mo.; NY. New York Botanical Garden, New York City; NYSM. New York State Museum, Albany, New York; UP, University of Pennsylvania, Philadelphia, Pa.; US. United States National Museum, Washington, D. C.

MAINE:			
Mt. Desert,	Aug. 25, 1897,	*E. P. Bicknell,*	US., NY.
Bar Harbor,	Aug. 25, 1897,	*E. P. Bicknell,*	NY.
York Harbor,	Aug. 25, 1897,	*E. P. Bicknell,*	NY.
Isle au Haut,	1919,	*N. T. Kidder,*	G.
VERMONT:			
Rutland,	July 19, 1911,	*G. L. Kirk,*	US., G.
Rutland,	July 19, 1922,	*G. L. Kirk,*	MBG.
RHODE ISLAND:			
South Kingston,	1935,	*J. F. Collins,*	G.
CONNECTICUT:			
New Haven,	1905,	*R. W. Woodward,*	US., G.
Chaplin,	1917,	*C. A. Weatherby* #4171	US., G.
NEW YORK:			
Garoga,	July 1884,	*Dr. C. H. Peck,*	NY., NYSM.
Port Washington, L. I.,	Sept. 16, 1915,	*Dr. Homer D. House,*	NYSM.
Brooklyn, (in bog of Botanic Garden)		*J. A. Drushel* # 9910,	US., MBG.
PENNSYLVANIA: *			
Philadelphia,	August, 1878,	*Isaac Burk,*	US.
Scott Center, Wayne County,	1943-4	*W. L. Dix,*	UP., AS.
NEW JERSEY:			
Caign's Point, Camden Co.		*Isaac Burk,*	UP.
Annandale,	Aug. 20, 1908,	*M. L. Fisher,*	MBG.

---

* Dr. David Sumstine reports that there is in the Carnegie Museum in Pittsburgh, Pa. a specimen of *Molinia caerulea* collected on the Campus of Duquesne University, Pittsburgh, Pa., in 1943. Without doubt this plant came from a mixture of lawn grass seed.

How Durand acquired Rafinesque's Herbarium

FRANCIS W. PENNELL

Just as this issue of Bartonia is going to press there has arrived from Professor P. A. Davies of the University of Louisville, who is engaged in preparing a life of Charles Wilkins Short, the photostat copy of a letter from Elias Durand to Dr. Short, dated June 4, 1856, which tells how and when Durand acquired the herbarium of C. S. Rafinesque. A portion of the letter reads:

"Yes! My dear Sir, I bought Rafinesque['s] herbarium—or in better words, it was forced upon me by his executor D^r Mease, who had no money of the deceased in hands to pay 45 Dollars storage. 45 Dollars ... What poor Rafinesque estimated 6000!

"But it was truly a dunghill, from the circumstance that it had remained three years in a stable garret, where a numerous colony of rats found it a convenient hiding and breading [breeding] place. It required indeed a botanical zeal equal to mine to consent [to] transfering to a decent house 6 cart-loads of that prodigious mass of corruption. Happily it was not a season of yellow fever! Not being fit to place in a room, I removed it to an obscure cellar, where, for a whole winter, I was occupied, by candle light, to separate the good from the rotten.

"Rafinesque's own specimens were trash, incomplete, good for nothing; He was the worst collector I ever knew; But I found in Collins' herbarium, in your own and D^r Buckley's plants, enough to repay my forty five Dollars, my soap & cologne water.

"There I saw the wonders he boasted of — The series of what he called his very rare specimens at 25 cents apiece, and a very small piece too; a disfigured flower and a few leaves, not spreading but more or less reflexed and rumpled; as for instance, his 8 or 9 species of Dodecatheon, all made up from the scapes more or less furnished with flowers of the common species, with leaves belonging to other genera; his new genera and species from the Apalach- Mountains (a locality he loved above all) which were simply exotic plants well known, but disfigured and with addition of parts that did not belong to them ... But enough about that poor insane—Requiescat in pace! Forgive my prolixity and believe me respectfully yours E. Durand."

In his letter to Dr. Short Durand reached the subject of Rafinesque by way of a comment on a plant that Short had sent him for verification, saying of it "Hypericum dolabriforme of Raf. is certainly different from yours, and I do not think that he found it in Kentucky." Durand suggested that it was actually gathered by Major LeConte in Georgia, because it matched LeConte's material in the Academy's herbarium, being "identical—in the very same state of florescence and everything else." Since LeConte was "a correspondent of M^r Collins", Rafinesque might have acquired a portion with Collins' herbarium. Short's herbarium subsequently came to the Academy of Natural Sciences of Philadelphia, although Durand's (and with it this specimen of Rafinesque's) is no longer here. But from Schweinitz' herbarium (and, as always, inscribed only in Schweinitz' hand) we have what appears to be part of the Rafinesque collection. Its data read "Hypericum dolabriforme Kentuck Raff", and the identification, as checked by current standards, is correct. We have further Kentucky collections from C. W. Short and from Charles Schaeffer. These seem quite different in leaves and sepals from the only LeConte specimen of this group that I now find here, one of *H. opacum* T. & G. that was originally named "Hypericum fasciculatum." I fail to sustain Durand in his suspicion, nor, since *H. dolabriforme* was described not by Rafinesque but in 1800 by Ventenat, in his next remark:

"If Rafinesque, in this instance, has really hit upon a new species, it was not always his case. No writer has ever made more lies than this poor insane man. I say insane — to justify, in some measure, his most impudent stories! Depend upon it, he never saw of his pretended thorny Aesculus but the prickly fruit of your Aesculus glabra."

This case shows both Durand's attitude toward Rafinesque and also the fallibility of his criticism. Rafinesque may have committed the misdemeanors of which he is accused, but I wish that we had knowledge of them on other evidence. Some years ago, in preparing an account of the "Travels and Scientific Collections of Thomas Nuttall", I had to evaluate Durand's "Biographical Notice of the late Thomas Nuttall", published by the American Philosophical Society in 1860, and I have little hesitation in pronouncing it the most inaccurate biography I know.[1] To find Durand at fault now in supposing that Rafinesque had proposed a new species and presumably so in misidentifying Rafinesque's specimen as being identical with Le Conte's from Georgia, does not lend confidence to his criticisms. Yet, he was doubtless right about the *Aesculus*, and he is certainly so in a remark upon a sheet before me now. It displays a specimen that is labeled by Rafinesque: "Veronica prostrata Oregon"; the "Oregon" is surrounded by a pencilled line that also encloses Durand's comment, "a lie of Rafinesque." For the sake not only of poor Rafinesque but of that posterity to which he so hopefully appealed, would that his herbarium had fallen into other hands!

Rafinesque's herbarium had been through various vicissitudes before reaching Durand. In my account of "The Life and Work of Rafinesque"[2] there appears on page 29 a summary of it, dated January 1, 1824, while he was at Transylvania University; then it comprised 37,740 specimens, which were valued at $2,387.00.

---

[1] For this account of Thomas Nuttall see BARTONIA 18: 1-51, 1936, and for comment upon Durand's accuracy various footnotes such as # 46 on page 25.

[2] Transylv. Coll. Bull. 15: 10-70, 1942. Address delivered October 30, 1940.

On his leaving Kentucky in 1826, the herbarium remained long in storage with the transportation company, as witnessed (p. 41) by Rafinesque's letter of January 2, 1832 to Dr. John Torrey, wherein he tells of the resultant damage: " I find upon an average one tenth of the plants lost or spoiled but not many of the new or rare ones. The loss will amount to at least 4000 specimens: but I shall have 36,000 left large and small." I suppose that by 1840 the herbarium had greatly increased for Rafinesque to have valued it at $6000.00.

In my account (p. 62) I presumed that Elias Durand was one of those who would have visited Rafinesque in his last illness, and spoke of his having purchased the herbarium then. Since Thomas Meehan, who had known Durand, said that he had done this " charitably ", I assumed that it had been to help the sick man in his need. But the letter to Short now quoted shows that Durand must be acquitted of any such generous act, and the tenor of his remarks leads me to doubt that he would have ever so visited Rafinesque. Instead of purchasing Rafinesque's herbarium in 1840, he did so in 1843 or 1844 and only on the solicitation of Dr. James Mease.[3]

Not only in this letter but in the statement accompanying his herbarium in Paris [4] Durand says candidly that he acquired Rafinesque's herbarium solely to obtain the plants of others that were in it—" I did not care much for his own plants. I knew that his specimens were miserable . . . ." We can picture Durand toiling by candle-light in an " obscure cellar " of Philadelphia just a hundred years ago, and see his eyes brighten with pleasure as he came upon some collection of Elliott, or Riddell, or Carpenter, that he deemed worth saving. Meanwhile the trash container was being filled with the undoubtedly poor specimens that bore however the peculiar and strange names that Rafinesque had assigned them. At some new generic name attached to something quite familiar to him—say, *Aureolaria* for a yellow *Gerardia*—we can see the impatient thrust that sent it to oblivion. Durand never dreamed that there would come rules of priority into nomenclature, or any other rules to supersede the perfect settling of our botanical problems that he was witnessing in the work of John Torrey and Asa Gray.[5] Besides who would ever think of reviving, or even investigating, the names suggested by such a madman as Rafinesque?

---

[3] A further assumption of my account proves erroneous. I supposed that Dr. Mease, who acted as Rafinesque's executor, was also his physician, but it appears that Dr. William Ashmead attended him in his last illness. A special account of this, entitled " Case of Cancer of the Stomach and Liver ", by Dr. Edward Hallowell, was published in the Medical Examiner for September 19, 1840 (actually issued in October). On receiving a copy of this overlooked publication from Mr. Guy N. Haldeman over a year ago, I sent for insertion in Chronica Botanica a summary of it with some comment under the caption, " The Last Sickness of Rafinesque." The patient received good medical attention.

[4] " The Durand Herbarium ", by Agnes Chase in BARTONIA 17: 40-45, 1936. Mention of Rafinesque herbarium on page 42.

[5] Durand's confidence in the finality of the taxonomic decisions of his time is stressed in my account of " Elias Durand and his Association with the Academy of Natural Sciences of Philadelphia " in BARTONIA 17: 33-39, 1936. After sorting out a series of one or two speci-

An occasional specimen that was in relatively good condition was saved, and so we journey to-day to the Museum d'Histoire Naturelle in Paris (to which, as a good Frenchman, Durand eventually gave his personal herbarium) to see what of Rafinesque's herbarium has survived in the Herbier Durand. As recounted nine year's ago in Bartonia both Mrs. Chase and I have done this, but she found no grasses and I only eight out of sixty species of Scrophulariaceae. Some fifty specimens or more were given by Durand to Dr. William Darlington and so survive in Darlington's herbarium at West Chester, Pa.,[6] but they are mostly of European species. Such survival is very little indeed, when we need so much to interpret Rafinesque's many propositions.

In my address of 1940 I tried to show that there was vision in the work of Rafinesque's later years, even though he was not equipped either by temperament or in resources to carry out the elaborate program that he had set himself. Nevertheless his attempt has to be taken seriously, and due effort made to record and account for his many botanical proposals. In a comprehensive " Index Rafinesquianus " Dr. E. D. Merrill is at last bringing together all of Rafinesque's names, but beyond this bibliographical undertaking botanists will long be laboring to explain just what was being described. Would that some one of a century later could have been in the cellar with Durand and told him which specimens to save! What an incredulous glance such an interloper would have received!

---

mens of each species as all that would be needed for convenient consultation of such unmounted material, Durand thought that his verification of the names would only " in some rare instances " need future correcting. To Gray he gave in 1866 what specimens he could of Nuttall, as " owing to the herbarium of D^r Gray, which was to be the standard herbarium of the North Amer. plants."

[6] " The ' Darlington Herbarium ' at West Chester ", by Robert B. Gordon in BARTONIA **22**: 6-9, 1943, the Rafinesque entry on page 8.

Franklin and Marshall College Herbarium at Lancaster, Pennsylvania

H. K. Groff, *Curator*

Lancaster County and Franklin & Marshall College in particular have been very fortunate in their botanical associations.

Rev. G. H. E. Muhlenberg, one of America's foremost early botanists and first Lancaster County collector was the first President of Franklin College. Unfortunately none of his specimens exist in our herbarium.

Thomas Conrad Porter was a professor at Marshall College in Mercersberg from 1840 until its merger with Franklin College in 1853, and then taught in Franklin & Marshall College until 1866. He was an assiduous collector in the County and some of his specimens remain here including a splendid series of mosses.

John Kunkel Small and A. Arthur Heller were students at the College together and many of their earlier collections were made here. A few of Small's Lancaster County specimens and a larger collection from the Blue Ridge Mountains of southwestern Virginia are in our herbarium.

Joel Jackson Carter, co-author with Dr. Small of the " Flora of Lancaster County ", gathered a large collection of plants in the southern part of the County, a small series of which we have.

Dr. Abram P. Garber, a physician from Columbia, left his own large collection to Franklin & Marshall College. Many local plants and specimens from the vicinity of Easton, Pa. are represented, but by far the greater number are from southern Florida where he collected for quite a number of years. He thoroughly explored the Keys and much of the Everglades and doubtless many of his specimens are from stations which no longer exist.

Many other collectors are represented as the following list will show, but specimens from such botanists as Canby and Bebb were given to Dr. Garber and not directly to the College.

It is unfortunate that no original catalogue of the herbarium could be found. Many persons had at one time or another started to catalogue the collection, but gave it up before completion and left only partial lists which were of no great help, as the next person attempting the job had his own system and left only a jumble of numbers which had no value.

After several years of hard work we have succeeded in completing the catalogue of the entire herbarium and have indexed it as to families and genera, using the Engler & Prantl system.

Estimated Specimens	Collectors	Dates	Localities and Notes
67	Bausman, J. W. B.	1872-1874	Lancaster County, Pa.
320	Bebb, M. S.	1867	Illinois
182	Billings, Braddish		Canada
288	Blake, Joseph		Maine; New Jersey
5	Burk, Isaac	1869	Pennsylvania
290	Canby, W. M.	1866-1868	Florida; North Carolina
60	Carpenter, Dana S.	1904	Vermont
68	Carter, J. J.	1867-1880	Southern Lancaster Co.
192	Clarke, Daniel		Michigan
190	Curtiss, A. H.	1867	Virginia
99	Day, David F.		New York
29	Eaton, D. C.	1860	(mostly ferns)
225	Fowler, James	1867	New Brunswick, Canada
3936	Garber, A. P.	1876-1880	Florida and Pennsylvania
452	Hall, Elihu	1862	Rocky Mountains
332	Harvey, W. H.		(Algae) Australia and Ceylon
56	Hoysradt, Lyman H.	1877	New York (mostly ferns)
623	Iishiba, Y.	1907	Japan (includes 173 mosses)
20	Knipe, S. W.	1870	Pennsylvania
1457	Land, Thomas S.	1905-1913	Pennsylvania and Maryland
10	Macoun, John	1868	Canada
384	Mell, C. D. & Knopf	1902-1904	various localities
49	Miller, E. S.	1877	New York (Wading River)
7	Mohr, Charles	1885	Alabama
130	Moyer, I. S.	1867	Pennsylvania and Maryland
61	Painter, J. H.	1903	D. C. and vicinity
163	Parker, C. F.	1866	New Jersey
560	Porter, T. C.	1860-1871	Pa. (incl. 80 mosses)
21	Porterfield, W. M.	1933	Panama (grasses)
18	Pringle, C. G.	1878	Vermont
64	Reverchon, Julien	1885	Texas
10	Roddy, H. Justin	1933	Lebanon Co., Pa.
128	Schiedt, R. C.	1909	Holly Beach Island, N. J.
768	Small, J. K.	1892-1896	Pennsylvania and Virginia
1568	Urban, A. E.	1909-1918	Lancaster County, Pa.
97	Vasey, G. R.	1875	California
12,865			

Notes

A Variant of the Nodding Trillium. While *Trillium cernuum* L. varies considerably in flower-size, and the larger extreme has been segregated as var. *macranthum* Eames and Wiegand, it is in general constant in corolla-hue,—white or faintly cream-color. Recently a well-marked color-form has been discovered in Pennsylvania by Louise F. A. Tanger (Mrs. C. Y. Tanger) of Lancaster. This has the petals deep pink, in Maerz & Paul's " Dictionary of Color " matching block 42-H-5, " opera mauve." It may be known as:

Trillium cernuum L., var. **typicum** Wherry, nom. nov., forma **tangerae** Wherry, nova. Peduncle 15-18 mm. long, strongly recurved; petals 15-20 mm. long and about 8 mm. wide, deep pink; anthers about 4.5 mm. long. (Pedunculus 15-20 mm. longus, valde recurvatus; petala 15-20 mm. longa, ca. 8 mm. lata, intense rosea; antherae ca. 4.5 mm. longae.)

Type in herbarium Academy of Natural Sciences of Philadelphia, collected by Edgar T. Wherry, May 5, 1945, in moist rocky woods near Iron Springs, Adams County, Pennsylvania. Some plants in the colony had paler pink corollas, but none were observed to be pure white. No other *Trillium* occurs in the vicinity, and there is no indication of hybridization.

The Martindale Herbarium. In the American Journal of Pharmacy for November, 1944, 116: 420-432, 4 ill., is an account by Dr. Theodor Philipp Haas of the " The Martindale Herbarium ", which has been " Fifty years in the possession of the Philadelphia College of Pharmacy and Science." There are reproduced a photograph of Isaac C. Martindale (1842-93) and of three sheets of specimens in the herbarium. Mr. Martindale[1] collected widely, but is locally best remembered for his interest in ballast plants. He assembled his large herbarium both by purchase and exchange. Thus, he bought in 1861 the collection of Ferdinand Rugel, and in 1874 the Swiss herbarium of J. Brunner. Besides collections of Edward Palmer and C. G. Pringle from Mexico and of H. H. Rusby from New Mexico and Arizona, which are evidently duplicates of specimens at the Academy of Natural Sciences, there are various series not otherwise in Philadelphia, such as those of N. J. Andersson from Sweden and elsewhere in northern Europe, of Ad. Chatin and of J. E. Planchon from France and elsewhere in western Europe, and of George W. Post from Syria and Palestine. Dr. Haas is cleaning and reorganizing this large and valuable herbarium, and we join him in hoping that after the war Martindale's ornate wooden cabinets may be replaced by modern metal cases.

---

[1] See Bartonia 22: 16, 1943.

Assistance to the Academy's Herbarium by Members of our Club. Ever since the founding of the Philadelphia Botanical Club more than fifty years ago, its members have volunteered their time and interest freely on behalf of the herbarium of the Academy of Natural Sciences of Philadelphia. To the early days belong the collaboration of Dr. Ida A. Keller with Stewardson Brown that resulted in the " Handbook of the Flora of Philadelphia and Vicinity " in 1905, the only book actually published by this Club. From 1903 to 1913 was the Curatorship of the Club's Herbarium (the Local Herbarium of the Academy) by Samuel S. Van Pelt;[2] who was directly succeeded by the present Curator, Bayard Long—a happy event of last season was the presentation on March 23, 1944 of a gift of books and an honorarium by members of our Club to Bayard Long in appreciation of his thirty years as Curator of the Club's Herbarium. Since 1922 Dr. Walter M. Benner, author of the " The Flora of Bucks County, Pennsylvania " in 1932, has assisted Mr. Long in caring for the Local Herbarium. From 1928 to his death in 1939 Arthur N. Leeds,[3] who from its commencement had been Treasurer of our Club, had curatorial oversight of the Academy's collections of Pteridophyta and also built up a valuable library about these plants. From his arrival in Philadelphia in 1930 Dr. Edgar T. Wherry has cared for the Academy's collections of Polemoniaceae, and from 1939 of its Pteridophyta also; on the former he has published extensively in Bartonia and elsewhere, and on the latter his illustrated " Guide to Eastern Ferns " in 1937 and with a second edition in 1942. Other members of the Club who have been assisting on special groups are from about 1920 to 1930 Dr. William Randolph Taylor, then of the University of Pennsylvania but now of the University of Michigan, on the Algae, an oversight now being continued by Dr. Ruth Patrick in addition to her curatorship of the Academy's microscopical department; since 1943, W. L. Dix, who has been renovating the Lichen Herbarium of Dr. John W. Eckfeldt,[4] an arduous task that had been commenced by Miss Claire Myers two years earlier; and since 1944 Leslie D. Stair, who has given Saturdays to work on the Academy's collections of Bryophyta, the renovation of which had been zealously undertaken from 1934 to 1938 by our employed Assistant Curator, Grace M. Tees. There still remains to mention the many who have aided in arranging the herbarium specimens geographically within the folders, among whom the most notable was Dr. Henry Leffman;[5] and those who have identified collections and distributed specimens to the cases, such as Dr. Hugh B. Meredith,[6] Ida K. Langman, and many more. Finally, for discriminating service of an historical nature the Academy's Herbarium is indebted to Dr. Edward E. Wildman, who since 1942 has been selecting type specimens from our folders for incorporation in a special reference series.

---

[2] BARTONIA 17: 1-3, 1935.

[3] BARTONIA 20: 30-32, pl. 1, 1940.

[4] BARTONIA 15: 57-59, 1933. Miss Myers was not a member of our Club.

[5] BARTONIA 13: 53-54. 1932.

[6] BARTONIA 11: 56, 1929.

Recent Books by Members of our Club.[7] " PENN'S WOODS 1682-1932 ", 192 pages, by Edward E. Wildman, reprinted by the author Oct., 1944, price $1.50.—An endeavor to locate and tell of such trees of the Philadelphia territory (drainage of the Delaware River) as are at least 250 years old, and so date from the time of William Penn. They have survived from the forest that gave the name to our state, Pennsylvania. Dr. Wildman gives all credit to the many who have aided this project. The book has been revised from the original edition of 1933. It is attractively printed, and many of the trees are shown in the illustrations.

A FLORA OF CHESTER COUNTY, PENNSYLVANIA ", 2 volumes, viii + 1470 pages, by Hugh E. Stone, published by the Academy of Natural Sciences of Philadelphia, 1945, price $10.00 (or with some illustrations hand-colored $15.00).—For many years Mr. Stone has been preparing the drawings and descriptions of Chester County plants that are now published. Original keys and descriptions are given for all species, and many of these are delineated in full-page illustrations. For each species there is a statement of its occurrence within the county, while for the rarer ones actual localities are cited. Mr. Stone reminds us that we are on classic ground by referring constantly to Dr. William Darlington's " Flora Cestrica " of a century ago.

"WEEDS OF LAWN AND GARDEN. A Handbook for Eastern Temperate North America ", vii + 215 pages, by John M. Fogg, Jr., University of Pennsylvania Press, 1945, price $2.50.—Drawings by Miss Leonie Hagerty serve to identify our most common weeds, while the text by Dr. Fogg gives information about the plant's occurrence and history. An introductory discussion on the nature of weeds, their origin and control, is of especial interest.

Recently Deceased Members, EDWARD PENNOCK (1856-1944) was actually one of the Founders of our Club, although he was later long out of its membership. His interest lay especially in microscopical botany, and he lived to be one of the oldest members of the American Microscopical Society. Those of us who were students at the University of Pennsylvania several decades ago will remember him in his shop for scientific books and instruments on Woodland Avenue.

A. ARTHUR HELLER (1867-1944) became a Corresponding Member of our Club in 1893, while at Franklin & Marshall College at Lancaster, Pa. He and his fellow-student John K. Small, had already been collecting together both in Lancaster County and in North Carolina.[8] Heller had received his A. B. in 1892, and then had spent the summer in northern Idaho. Two years later he was in Texas and his collections there formed the basis of a special report entitled "Botanical Explorations in Southern Texas during the Season of 1894" that was published in 1895 as Number I of the Contributions from the Herbarium of Franklin & Marshall College.[9] The College conferred on him in 1897 the degree of A.M., and in 1911 that of Sc.D. In 1895 Heller collected on the Hawaiian Islands, and then, after two years as assistant at the University of Minnesota, was again in the Tropics, collecting in 1898-99 on Puerto Rico. His subsequent collecting was wholly in the United States. From 1900 to 1915 he published a botanical journal, Muhlenbergia, and its different places of appearance show us Heller's various headquarters during this interval: Lancaster, Pa., 1900-01; Los Gatos, Calif., 1902-08; Reno, Nev., 1908-12; Chico, Calif., 1913-15. At Reno he was with the University of Nevada. Throughout these years he collected vigorously, and his sets of beautiful specimens, especially rich in plants of California and Nevada, have been widely distributed. Though he relinquished his independent journal and collected at a slower pace, his zeal continued through all his subsequent life. He remained until death at Chico in northern California, and there my wife and I had the pleasure of visiting him and his daughter in 1940. We drove together up the canyon of the Feather River, and I recall the ample collections he made of a *Lupinus* that he subsequently described as a new species. This was a year or more after the death of Mrs. Heller, who, from the days when as E. Gertrude Halbach she had shared his early collecting, was of such vital assistance to him. Few American botanists have ever collected so extensively as A. Arthur Heller, and the Academy is fortunate in possessing many series of his specimens.

---

[7] These works may be procured at the Academy of Natural Sciences.

STEWART H. BURNHAM (1870-1943) was made a Corresponding Member of our Club in 1911. He had a keen knowledge of the plants of New York State, and his papers were mostly records of species observed in various districts; some dealt with flowering plants, but most with ferns, mosses, hepatics, and lichens. In his later years he was associated with the herbarium of Cornell University.

---

[8] Although both Heller and Small, who was two years the junior, collected vigorously in Lancaster County and in the Southeast, it was the latter who in 1903 brought out the "Flora of the Southeastern United States" and in 1913, with Joel J. Carter, the "Flora of Lancaster County". Heller, although he published many new species based upon his field-acquaintance with plants, remained primarily the ardent collector.

[9] Because so definitely a report of the herbarium, I have been assuming that the actual types of those new species that Heller described in this report were at Franklin & Marshall College, but Dr. Groff's summary of the herbarium published in this issue of BARTONIA shows that they are no longer there. I suspect that, through Dr. Small's influence, Heller's entire Texas series was transferred to the New York Botanical Garden, although I am surprised that no duplicates were left in Lancaster.

J. FLETCHER STREET (1880-1944) was an Active Member of our Club from 1918, although he will be chiefly remembered for his popular books on birds and mammals.

ADOLPH MÜLLER (1878-1943) became an Active Member of our Club in 1920. That summer he made a trip to the mountains of southern Yukon Territory, and on his return presented to the Academy an interesting collection from the vicinity of Lake Kluane and Don Jek River. He had a nursery for trees at Norristown, Pa., and was best known locally for his zealous championship of the flowering dogwood (*Cornus florida*) for ornamental planting.

SAMUEL N. BAXTER (1881-1945) became an Active Member of our Club in 1918, and from 1926 has been an Honorary Member in recognition of the scientific value of his work for the Park Commission of Philadelphia. A lifelong resident of our city, he was first associated with the nurserymen, Thomas Meehan and Sons, but became in 1912 arboriculturist for the Park Commission and in 1923 landscape gardener of Fairmount Park. To readers of Bartonia he will be remembered as the author of an article in our Bartram Issue of 1931 that told of the " Restoration of Plants in Bartram's Garden by the Fairmount Park Commission of Philadelphia ". For years he was President of the Germantown Horticultural Society, and he similarly served as executive or chief officer of organizations devoted to development of parks through the nation. He died on September 24th, just as this issue of Bartonia is passing through press.

Program of Meetings during 1943

Date	*Subject*	*Speaker*	*Attendance*
Jan. 28	(Meeting postponed until February 25 on account of snow storm)		
Feb. 25	Linnaeus and the Sources of his Knowledge of our Eastern Flora	Francis W. Pennell	27
Mar. 25	The Flora of the West Indies	Fairman R. Furness	31
Apr. 22	Various Records of Sex in Plants	Conway Zirkle	11
May 27	The Darlington Herbarium at West Chester	Robert B. Gordon	
	Some Chester County Plants	Hugh E. Stone	25
Sept. 23	Reports by Members on Summer Work		28
Oct. 28	More Rare Plants	Mrs. J. Norman Henry	32
Nov. 18	Plant Life of the Colombian Andes	Francis W. Pennell	40
Dec. 16	Plant Portraits, Wild and Tame	Edgar T. Wherry	27

Program of Meetings during 1944

Date	*Subject*	*Speaker*	*Attendance*
Jan. 27	Wild Flowers of the Alleghanies	H. P. Sturm	52
Feb. 24	Plants of the Munich Botanical Garden	Theodore Phillipp Haas	27
Mar. 23	Exploring beyond the Frontier in Northern British Columbia	Mrs. J. Norman Henry	60
Apr. 20	Some Phases of Rafinesque's Botanical Work	Elmer D. Merrill	34
May 25	A Hobbyist's Kodachrome Photography of Wild Flowers	C. I. Stiteler	34
Sept. 28	Inspection of the Academy's Herbaria and Exhibition of Historical Books and Floras		20
Oct. 26	Herbals, and other early Botanical Works	Mrs. Edward M. Cheston	14
Nov. 16	A New Flora of Chester County, Pennsylvania	Hugh E. Stone	32
Dec. 21	From the Smoky Mountains Northward to the New Jersey Pine Barrens	John Gill	38

List of Officers and Members, 1943-1945

FRANCIS W. PENNELL, *President*

HARRY W. TRUDELL, Vice-President, 1943

MRS. J. NORMAN HENRY, *Vice-President,* 1944

WALTER M. BENNER, *Secretary*

LEE SOWDEN, *Treasurer*

BAYARD LONG, *Curator*

FRANCIS W. PENNELL, *Editor of* BARTONIA

ACTIVE MEMBERS

(as of August 1, 1945)

	Elected
J. W. Adams, 32 Pleasant St., Philadelphia 19, Pa.	1925
Mrs. A. C. Barnes, Latch's Lane, Merion, Pa.	1942
Edwin B. Bartram, Bushkill, Pa.	1906
J. Russel Bebler, 135 E. Phil Ellena St., Philadelphia 19, Pa.	1919
Dr. Walter M. Benner, 5636 Loretta Ave., Philadelphia 24, Pa.	1912
Jasper T. Bentley, 7334 Rural Lane, Philadelphia 19, Pa.	1933
Dr. David Berkheimer, 518 Elm St., Reading, Pa.	1943
Carl E. Bliss, 76 N. Grove St., East Aurora, N. Y.	1924
Carl Boyer, Wagner Institute, 17th St. and Montgomery Ave., Philadelphia 21, Pa.	1926
John Bright, 511 Cheltena Ave., Jenkintown, Pa.	1943
Miss Ethel Brubaker, " The Fairfax," 43rd & Locust Sts., Philadelphia 4, Pa.	1939
William C. Brumbach, Esterly, Pa.	1943
Lloyd G. Carr, Dept. of Botany, University of Pennsylvania, Philadelphia 4, Pa.	1942
Miss Marie Chillas, 233 Winona Ave., Philadelphia 44, Pa.	1941
Richard B. Chillas, 233 Winona Ave., Philadelphia 44, Pa.	1942
Prof. M. A. Chrysler, Rutgers University, New Brunswick, N. J.	1931
F. Van Buren Connell, " Hollybrook ", Brookside Ave., Wayne, Pa.	1924
Palmer DePue, 4209 Longshore St., Philadelphia 35, Pa.	1939
W. H. Dix, 801 Crown St., Morrisville, Pa.	1942
Robert T. Dreisbach, 301 Helen St., Midland, Mich.	1922
Leonard J. Duersmith, 511 Walnut St., Columbia, Pa.	1931
Miss Elizabeth C. Earle, 4209 Chester Ave., Philadelphia 4, Pa.	1935
Howard W. Elkinton, 6514 Germantown Ave., Philadelphia 19, Pa.	1931
Mrs. Nellie Erisman, 1821 Mt. Vernon St., Philadelphia 30, Pa.	1945
Mrs. Harold Evans, " Awbury ", E. Washington Lane, Philadelphia 38, Pa.	1931
Richard Blossom Farley, " Sarobia ", Eddington, Pa.	1931
Dr. John M. Fogg, Jr., University of Pennsylvania, Philadelphia 4, Pa.	1921
Fairman R. Furness, Media, Pa.	1935
Miss Elizabeth A. Gest, R. D. 1, Telford, Pa.	1944
John Gill, 2 Linden Ave., Haddonfield, N. J.	1939
Mrs. John Gilpin, Sugar Loaf Orchard, Chestnut Hill, Philadelphia 18, Pa.	1943
Dr. Robert B. Gordon, 415 Sharpless St., West Chester, Pa.	1942
Miss Léonie Hagerty, 21 W. Pomona St., Philadelphia 44, Pa.	1944
Louis E. Hand, 8061 Fairview St., Philadelphia 36, Pa.	1936
Miss Ann Harbison, " The Barclay," 18th St. and Rittenhouse Square, Philadelphia 3, Pa.	1944
Arthur M. Henry, 416 New Post Office, Atlanta, Ga.	1927
Howard K. Henry, 1464 Grayton St., Penn Wynne, Pa.	1932
Mrs. J. Norman Henry, Gladwyne, Pa.	1932
Miss Josephine de N. Henry, Gladwyne, Pa.	1938
Miss L. K. Herring, 444 Queen Lane, Philadelphia 44, Pa.	1942
F. F. Huber, Pennsburg, Pa.	1911
Lee P. Hynes, 36 West End Ave., Haddonfield, N. J.	1939
Miss Nancy E. James, 4043 Baltimore Ave., Philadelphia 4, Pa.	1942

Charles F. Jenkins, Kitchens Lane, Philadelphia 19, Pa. 1934
Miss Clara Kast, 2004 Spring Garden St., Philadelphia 30, Pa. 1932
Miss Natalie B. Kimber, 538 E. Locust Ave., Philadelphia 44, Pa. 1928
Rev. William U. Kistler, 118 Main St., Pennsburg, Pa. 1911
Charles E. Knopf, 7161 Georgian Road, Philadelphia 38, Pa. 1931
Dr. Henry A. Laessle, 5900 Market St., Philadelphia 39, Pa. 1894
Mrs. Ida K. Langman, 2316 Delancy Place, Philadelphia 3, Pa. 1937
Morris E. Leeds, 1025 Westview St., Philadelphia 19, Pa. .... Founder
Dr. Hui-Lin Li, Academy of Natural Sciences, Philadelphia 3, Pa. 1944
Dr. Harry A. Lloyd, 200 N. 35th St., Philadelphia 4, Pa. 1931
Bayard Long, 250 Ashbourne Road, Elkins Park, Philadelphia 17, Pa. 1906
Ernest H. Ludwig, Walter Reed General Hospital, Washington, D. C. 1938
George F. Nicklas, 400 S. 9th St., Philadelphia 47, Pa. 1944
Mrs. George B. Orr, " Orchard Way ", Berwyn, Pa. 1935
Miss Elizabeth G. Ostheimer, Jenkintown, Pa. 1933
Dr. Samuel C. Palmer, 26th and Chestnut Sts., Chester, Pa. 1929
Dr. Ruth Patrick, Academy of Natural Sciences, Philadelphia 3, Pa. 1937
Dr. Francis W. Pennell, Moylan, Pa. 1910
Mrs. Venia T. Phillips, Secane, Pa. 1944
Richard W. Pohl, Box 374, Colorado City, Texas 1940
Harold W. Pretz, 123 S. 17th St., Allentown, Pa. 1909
George R. Proctor, 140 W. Main St., Newark, Del. 1944
Mrs. Karl Rugart, 612 Bryn Mawr Ave., Penn Valley, Pa. 1942
Robert L. Schaeffer, Jr., 32 N. 8th St., Allentown, Pa. 1938
Dr. J. R. Schramm, Dept. of Botany, University of Pennsylvania, Philadelphia 30, Pa... 1937
Miss Helen B. Shriver, 2004 Spring Garden St., Philadelphia 30, Pa. 1935
Henry Skinner, Morris Arboretum, Chestnut Hill, Pa. 1942
Lee Sowden, 3823 Oak Road, Philadelphia 29, Pa. 1901
Leslie D. Stair, 141 Fern Ave., Collingswood, N. J. 1944
Dr. Walter Steckbeck, Dept of Botany, University of Pennsylvania, Philadelphia 4, Pa. 1925
Hugh E. Stone, 431 Berkley Road, Haverford, Pa. 1892
Dr. Robert R. Tatnall, 1100 W. Tenth St., Wilmington, Del. 1928
Horace E. Thompson, 5016 Schuyler St., Philadelphia 44, Pa. 1920
Wm. Thompson, Jr., Leroy Court Apts. # 403, 1700 S. 60th St., Philadelphia 42, Pa. 1936
R. J. Titherington, 6317 N. Norwood St., Philadelphia 38, Pa. 1942
Harry W. Trudell, 303 Highland Ave., Abington, Pa. 1915
Miss Helen Vrooman, Ashbridge Road, Rosemont, Pa. 1942
Dr. Paul R. Wagner, Ursinus College, Collegeville, Pa. 1935
Warren H. Wagner, 7708 N.W. Morningside Drive, Washington, D. C. 1942
E. Perot Walker, 511 Lynmere Road, Bryn Mawr, Pa. 1939
Mrs. Marguerite L. Warnke, 142 S. Logan Ave., Audubon, N. J. 1935
Robert F. Welsh, 325 Chestnut St., Philadelphia 6, Pa. 1909
Dr. Edgar T. Wherry, Dept. of Botany, University of Pennsylvania, Philadelphia 4, Pa. 1925
Stanley D. Wikoff, 2007 Arch St., Philadelphia 3, Pa. 1944
Hans Wilkens, 424 S. 15th St., Reading, Pa. 1928
William H. Witte, Riegelsville, Pa., R. D. 1898
Carroll E. Wood, Jr., 434 High St., Salem, Va. 1942
Howard Wood, Jr., " Aloha," R. D. 1, Conshohocken, Pa. 1944
Miss Mary F. Wright, 538 E. Locust Ave., Philadelphia 44, Pa. 1928

HONORARY MEMBERS

Charles M. B. Cadwalader, Academy of Natural Sciences, Philadelphia 3, Pa.	1944
Dr. Joseph S. Illick, State College of Forestry, Syracuse, N. Y.	1925
Dr. Edward E. Wildman, 4331 Osage Ave., Philadelphia 4, Pa.	1931

CORRESPONDING MEMBERS

Dr. John H. Barnhart, New York Botanical Garden, New York, N. Y.	1936
Otway H. Brown, Cape May, N. J., R. F. D. #1	1908
Prof. M. L. Fernald, Gray Herbarium, Harvard University, Cambridge, Mass.	1929
Dr. Harold St. John, University of Hawaii, Honolulu, T. H.	1927
Dr. William Randolph Taylor, University of Michigan, Ann Arbor, Mich.	1921
Dr. Campbell E. Waters, Chevy Chase, Washington, D. C.	1904
Dr. Heber W. Youngken, Massachusetts College of Pharmacy, Boston, Mass.	1918

RECENTLY DECEASED MEMBERS

	Died
Samuel N. Baxter, Honorary	Sept. 24, 1945
Stewart H. Burnham, Corresponding	Sept. 25, 1943
Amos Arthur Heller, Corresponding	May 18, 1944
Adolph Müller, Active	July 30, 1943
Edward Pennock, Honorary	Aug. 15, 1944
J. Fletcher Street, Active	Sept. 19, 1944

Index to Species

(Names of new entities in **bold-face** type; of synonyms in *italic* type.)

Aesculus *alba*, 33; *arborea*, 33; *florida*(*na*), 22; glabra, 44; *neglecta*, 22; *parva*, 33; pavia, 11, 12, 22, 33; stolonifera, 16; sylvatica, 12, 22, 34; *virginiana*, 22; *virginica*, 35
Andromeda *formosissima*, 22; *nitida*, 18; *plumata*, 18; *pulverulenta*, 17, 22; *viridis*, 33
Annona *alba*, 33; *grandiflora*, 17, 22, 23; *incana*, 23, 33; *obovata*, 17, 22, 23; *pygmaea*, 17, 23
Arethusa *pulcherrima*, 33
Asclepias *carnosa*, 33; *coccinea*, 33; *fragrans*, 33
Asimina *angustifolia*, 23; incana, 23; *obovata*, 23; pygmaea, 23; secundiflora, 23
Aster *fruticosus*, 33
Asyneuma **prenanthoides**, 36
Azalea calendulacea, 34; *coccinea*, 33; *flammea*, 33, 34; *flammula*, 33, 34; *nuda*, 34; *rosea*, 34; speciosa, 34

Bartramia bracteata, 16, 23
Bignonia *bracteata*, 16, 23

Cacalia *heterophylla*, 13, 24
Campanula americana, 37-39; lasiocarpa, 37; *prenanthoides*, 36; rotundifolia, 38, 39
Cassine *yapon*, 34
Castanea pumila, 25
Cerothamnus inodorus, 30
Chamaerops *serrulata*, 25
Chironia *pulcherrima*, 34
Citrus *limon*, 34; *verrucosa*, 34
Cleome *edulis*, 25; *lupinifolia*, 24
Clinopodium coccineum, 25
Conradia fuschioides, 25; *lecontei*, 25
Convolvulus *dissectus*, 25
Corypha *obliqua*, 25; *palma*, 34; *palmetto*, 34; *repens*, 12, 25
Crinum *floridanum*, 34
Cucurbita peregrina, 25

Dasystoma *tubulosa*, 25
Ditrysinia ligustrina, 32

Erythronium *maculatum*, 34

Fagus chinkapin, 25; sylvatica, 11
Filix *osmunda*, 33, 34; *scandens*, 33
Franklinia alatamaha, 18, 19, 34
Fraxinus *aquatica*, 34

Garberia *fruticosa*, 24; **heterophylla**, 24
Gentiana *caerulea*, 34
Gerardia *flammea*, 25, 26
Geum *odoratissimum*, 26
Gilia rubra, 27
Gymnanthes *ligustrina*, 32

Hedera *carnosa*, 26
Heracleum *lanatum*, 26; maximum, 26
Hydrangea quercifolia, 17, 26
Hydrocotyle *fluitans*, 34
Hypericum aureum, 27; dolabriforme, 43, 44; frondosum, 27

Ipomoea *erecta*, 11, 13, 27
Ixia *caelestina* (*coelestina*), 17, 27

Juglans *acuminata*, 34; *exaltata*, 34; *hickory*, 34; *nigra*, 11; *rustica*, 34
Juniperus *americana*, 34

Kalmia *ciliata*, 27; *hirsuta*, 28; *spuria*, 34
Kalmiella hirsuta, 28

Laurocerasus caroliniana, 31
Laurus *borbona*, 11
Leptoclinium *fruticosum*, 24
Leucothoe acuminata, 22
Liatris *fruticosa*, 24
Lobelia berlandieri, 39, 40; b. **brachypoda**, 40; *brachypoda*, 39, 40
Lonicera canadensis, 18
Lupinus *breunis*, 28; diffusus, 28; *filifolius*, 34; villosus, 23
Lycium carolinianum, 28; *salsum*, 28
Lygodium palmatum, 33

Macranthera flammea, 25, 26; *fuchsioides*, 25; *lecontei*, 25
Macrothyrsus odorata, 16
Magnolia *auriculata*, 17, 28, 29; fraseri, 29; grandiflora, 11; macrophylla, 29; pyramidata, 12, 29
Malachodendron ovatum, 32; *pentagynum*, 32
Mimosa *virgata*, 29
Molinia caerulea, 41, 42
Morus rubra, 11
Muscadinia rotundifolia, 32
Mussaenda *bracteata*, 24
Myrica inodora, 29

Nemastylis coelestina, 27
Neptunia lutea, 29
Nyssa oge(e)che, 18, 30; *tupilo*, 34

Oenothera grandiflora, 30
Operculina dissecta, 25
Ophrys insectifera (*insectoria*), 34
Orchidocarpum pygmaeum, 23

Padus *caroliniana*, 31
Panax *ginseng*, 34, 35
Pancratium *fluitans*, 34
Panicum *hiretellum*, 12, 30, 31
Parthenocissus quinquefolia, 26
Passiflora incarnata, 15
Pavia sylvatica, 34
Pepo *okeechobensis*, 25
Persicaria *amphibia*, 34
Phlox *altissima*, 4; *bridgesii*, 5; *carnea*, 3, 5, 6; carolina, 1-9; c. **turritella**, 7, 8, 9; *caroliniana*, 3; *colydrana*, 3; *glaberrima*, 4, 5, 6, 9; *heterophylla*, 6, 7; *maculata*, 4, 6, 9; *nitida*, 4; ovata, 3, 9; *revoluta*, 5; *suffruticosa*, 4; *triflora*, 5, 6
Pimecaria odorata, 16
Pinckneya bracteata, 24; *pubens*, 24
Pinus *balsamea* (*balsamica*), 34; palustris, 12; *phoenix*, 34; *squamosa*, 34; taeda, 12
Pityothamnus *angustifolius*, 23; incanus, 23; pygmaeus, 23
Porcellia *pygmaea*, 23
Prunus angustifolia, 34; *caroliniana*, 31; *chicasa*(*w*), 34; *indica*, 34; *nemoralis*, 31
Pteris *scandens*, 33

Quercus *castania*, 34; chapmani, 31; *cinerea*, 31; *dentata*, 34; *flammula*, 34; *glandifer*, 34; *hemispherica*, 34; incana, 31; *laciniata*, 34; *lobata*, 34; *maritima*, 31; myrtifolia, 31; *sempervirens*, 15; *tinctoria*, 11, 31, 34; velutina, 31

Rhexia *pulcherrima*, 34
Rhododendron calendulaceum, 34; speciosum, 34; *spurium*, 34
Robinia *montana*, 34; viscosa, 34
Rosa, *paniculata*, 35
Ruellia *infundibuliformis*, 35
Russelia *flammea*, 25

Sabal palmetto, 34
Salix *fluvialis*, 35
Salpinogostylis coelestina, 27
Salvis *graveolens*, 35
Sarracenia *drummondii*, 32; *galeata*, 35; *lacunosa*, 31; leucophylla, 32; minor, 32
Sebastiania fruticosa, 32
Serenoa repens, 25; *serrulata*, 25
Smilax pseudo-china, 12
Staphylea trifolia (*trifoliata*), 35
Stillingia *frutescens*, 32; *fruticosa*, 32; *ligustrina*, 32
Stuartia (*Stewartia*) *montana*, 12, 32; ovata, 32; *pentagyna*, 32
Styrax *latifolius*, 35

Tillandsia *lingulata*, 32; *monostachya*, 35; utriculata, 32
Tomilix bracteata, 25
Toxopus calycinus, 25; *gymnanthes*, 25
Trillium cernuum f. **tangerae**, 49

Ulmus *suberifera*, 35; *sylvatica*, 35

Verbena *corymbosa*, 35
Viburnum *canadense*, 35
Vitis *allobrogica*, 35; *campestris*, 32; labrusca, 33; *rotundifolia*, 32

Wahlenbergia *gracilis*, 36, 37; marginata, 36, 37

Ximenia americana, 16

Zenobia pulverulenta, 22
Zizyphus *scandens*, 35

Index to Persons Considered

Anderson, N. J., 49

Bartram, William, 10-21; Bausman, J. W. B., 48; Baxter, S. N., 53; Bebb, M. S., 48; Benner, W. M., 50; Billings, Braddish, 48; Blake, Joseph, 48; Brown, Stewardson, 50; Brunner, J., 49; Burk, Isaac, 48; Burnham, S. H., 52

Canby, W. M., 48; Carpenter, D. S., 48; Carter, J. J., 47, 48, 52; Chatin, A., 49; Clarke, Daniel, 48; Curtiss, A. H., 48

Day, D. F., 48; Dix, W. L., 50; Durand, Elias, 43-46

Eaton, D. C., 48; Eckfeldt, J. W., 50

Fogg, J. M., 51; Fowler, James, 48

Garber, A. P., 47, 48

Haas, T. P., 49; Halbach, E. G., 52; Hall, Elihu, 48; Harvey, W. H.; Heller, A. A., 47, 51, 52; Hoysradt, L. N., 48

Iishiba, Y., 48

Keller, I. A., 50; Knipe, S. W., 48; Knopf, ——, 48

Land, T. S., 48; Langman, I. K., 50; Leeds, A. N., 50; Leffman, Henry, 50; Long, Bayard, 50

Macoun, John, 48; Martindale, I. C., 49; Mell, C. D., 48; Meredith, H. B., 50; Miller, E. S., 48; Miller, Philip, 35; Mohr, Charles, 48; Moyer, I. S., 48; Müller, Adolph, 53; Muhlenberg, G. H. E., 47; Myers, Claire, 50

Painter, J. H., 48; Palmer, Edward, 49; Parker, C. F., 48; Patrick, Ruth, 50; Pennock, Edward, 51; Planchon, J. E., 49; Porter, T. C., 47, 48; Porterfield, W. M., 48; Post, G. W., 49; Pringle, C. G., 48, 49

Rafinesque, C. S., 43-46; Reverchon, Julien, 48; Roddy, H. J., 48; Rugel, Ferdinand, 49; Rusby, H. H., 49

Schiedt, R. C., 48; Small, J. K., 47, 48, 52; Stair, L. D., 50; Stone, H. E., 51; Street, J. F., 53

Tanger, L. F. A., 49; Taylor, W. R., 50; Tees, G. M., 50

Urban, A. E., 48

Van Pelt, S. S., 50; Vasey, G. R., 48

Wherry, E. T., 7, 50; Wildman, E. E., 51

No. 24 1946

BARTONIA

JOURNAL OF THE
PHILADELPHIA BOTANICAL CLUB

CONTENTS

A New Lily from Southern Alabama and Northern Florida ...... MARY G. HENRY 1

A Key to the Eastern North American Lilies .... EDGAR T. WHERRY 5

A Collection of Plants from Yakutat, Alaska ..... L. D. STAIR and F. W. PENNELL 9

Notes on Pennsylvania and New Jersey Grasses .... RICHARD W. POHL 22

New Plant Names published by Amos Eaton between the Years 1817 and 1840
E. D. MERRILL and J. R. REEDER 26

Otway H. Brown .... W. M. BENNER and F. W. PENNELL 80

Program of Meetings during 1945 82

List of Officers and Members, 1945-1946 82

Index to Species 86

PUBLISHED BY THE CLUB
ACADEMY OF NATURAL SCIENCES, NINETEENTH AND THE PARKWAY,
PHILADELPHIA
ISSUED FEBRUARY 15, 1947

MISSOURI BOTANICAL
RECEIVED
FEB 28 1947
GARDEN LIBRARY

BARTONIA

Journal of the Philadelphia Botanical Club.

A journal devoted primarily to the Flora of the mid-eastern and southeastern United States, especially of eastern Pennsylvania, New Jersey and Delaware.

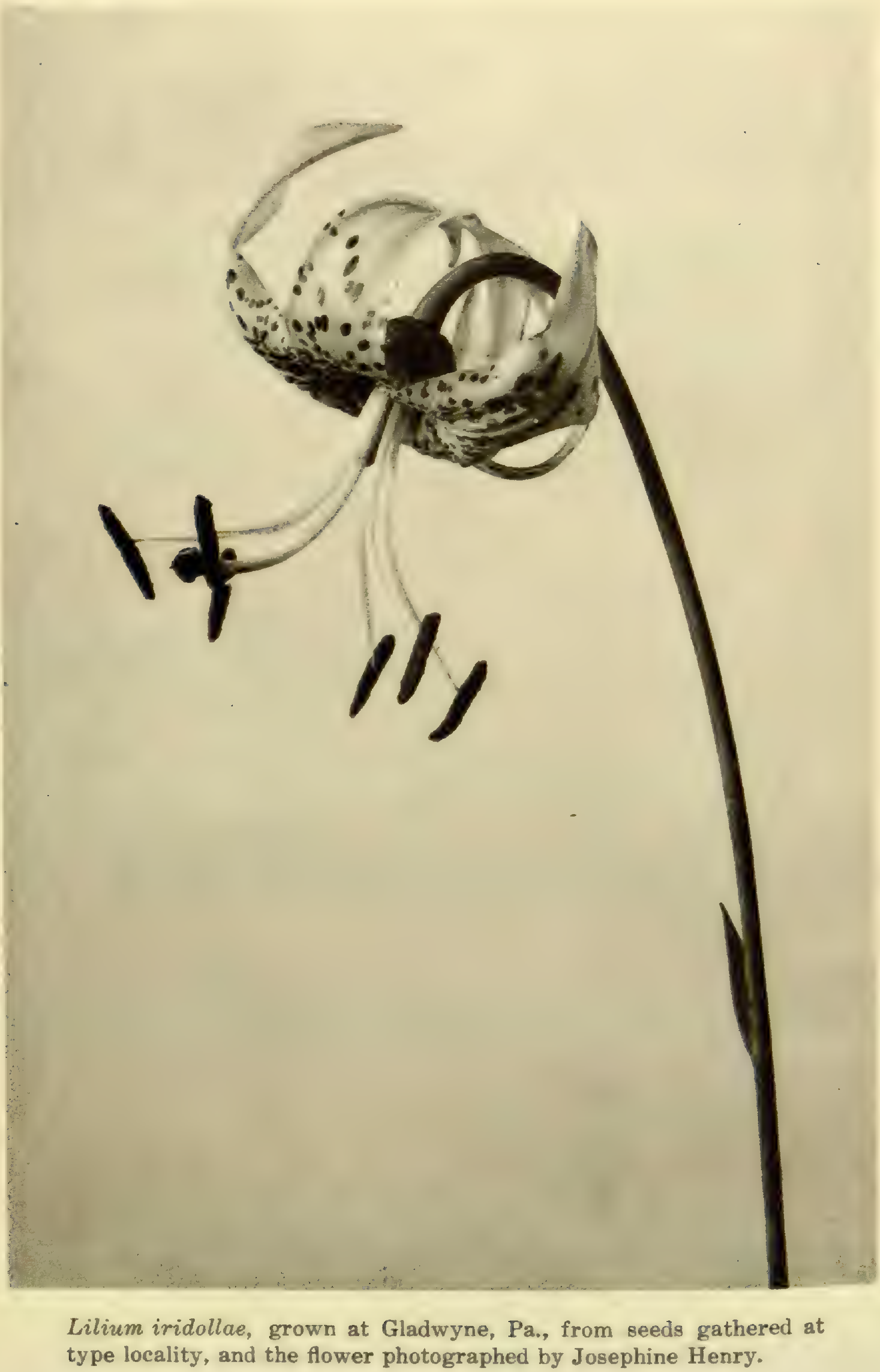
Subscription Price, $1.00. Past numbers, $1.00 each.

Contributors of articles having four or more pages will receive gratis fifty reprints. Additional reprints, if ordered in advance, may be purchased at cost.

Address

DR. FRANCIS W. PENNELL,
Editor,

Academy of Natural Sciences, Nineteenth and the Parkway,
Philadelphia 3, Pa.



Lilium iridollae, grown at Gladwyne, Pa., from seeds gathered at type locality, and the flower photographed by Josephine Henry.

BARTONIA

JOURNAL OF THE PHILADELPHIA BOTANICAL CLUB

No. 24 PHILADELPHIA, PA. 1946

A New Lily from Southern Alabama and Northern Florida

MARY G. HENRY

On October 15, 1940 I collected herbarium specimens and seeds of a *Lilium* that grew in a low meadow along a creek north of Elberta, Baldwin County, near the Gulf coast in southern Alabama. At that late date the seed capsules were nearly ripe. All the plants were single-flowered and grew about 10 to 14 decimeters (3 to 5 feet) tall. The bulbs were white and amazingly small, being only about 2 cm. in diameter and slightly more in height. They were buried about 5 to 8 cm. (2 to 3 inches) below the surface of the black muck.

There were about a dozen of these lilies along the edge of the shrubbery bordering the creek. This shrubbery was composed of *Cliftonia monophylla, Cyrilla racemiflora, Myrica inodora, Rhododendron serrulatum, Clethra alnifolia,* and species of *Viburnum* and *Vaccinium.*

Local residents told me that only a few years previously " the meadow was yellow with lilies ", and school children added " The flowers looked like yellow bells ". It was evident that the meadow was now being heavily grazed by cattle, and that only those plants which were protected by the shrubs had survived. The yellow color, as denoted by the phrase " yellow bells ", and a definite roughness on the lower surface of the leaf-veins, led me to believe that I had discovered an undescribed southern form of *Lilium canadense.*

On February 2, 1941, I planted seeds of this lily in sandy peat in a 12 × 12 inch box in a cold frame at my home in Gladwyne, Pennsylvania. The resulting seedlings were small and grew slowly. As the ensuing war years gave me scant time, these seedling lilies were greatly neglected. However, five of them bloomed in September, 1945. These lilies have made an autumnal growth of narrow leaves that are evergreen. Heavy freezing with zero temperatures has not destroyed either the exposed leaves or the bulbs.

During the season of 1946 I have been four times to southern Alabama and western Florida in further search of this lily. The visit of early August found it in full bloom, and produced the plant in suitable meadows from Baldwin County, Alabama eastward to Walton County, Florida. This field acquaintance has convinced me of the specific distinctness of the plant.

As an ardent lover of lilies, who has searched far for them and grown them in my wild garden, I have long hoped that I might chance upon some attractive species which had remained unknown to science. This beautiful and delicately fragrant lily is all that I could have desired in my fondest anticipations. Because of the rich yellow color one may liken its flower to a golden treasure, and because it is the " pot of gold " at the foot of my rainbow, I am calling this new species " **Lilium iridollae** ".

TECHNICAL DESCRIPTION

Bulb of each season globose, less than 2 cm. in diameter at time of anthesis, the slender rhizome connecting the several bulbs with a few scattered scales.

Stem 5-20 dm. tall, erect, slightly roughened and rooting near base, proximally lightly flecked and suffused with brown, distally smooth and light green. Leaves verticillate, or sometimes scattered throughout, the blades oblanceolate to obovate or rarely elliptic, 5-9 cm. long, 1.3-2.5 cm. wide, slightly roughened on the margins and also beneath proximally on the veins (of which the midrib is prominent and sometimes also a lateral pair). Uppermost leaves so small and remote that the stem appears to be distally naked.

Flowers usually solitary, but sometimes several (as many as eight have been noted), nodding and with well-recurved segments as in *Lilium superbum*. Buds 6-8 cm. long. Petals 7.5-10 cm. long, 1.5-2.5 cm. wide, the sepals slightly longer and wider; both sepals and petals " warm buff-yellow "[1] to golden-yellow, deepening slightly along median line, conspicuously spotted with " Hessian brown " and also near apex usually obscurely flecked or stippled with pinkish red, the perianth-segments externally buff to yellow with green base, and each internally with a conspicuous green nectariferous furrow.[2] Filaments 4-6 cm. long, slender, widely outcurving, greenish white; anthers at beginning of anthesis 1.7-2 cm. long, but after three days shrinking to 1.1-1.4 cm. long, the pollen deep brownish red (" bright mahogany red ") to brownish yellow. Style 3.3 cm. long, slender, greenish white; stigmas slightly parted (so whole stigmatic mass 3-lobed), rounded or slightly flattened distally, greenish yellow to darkest brown.

Bulbi plures parvi albi rhizomate connexi; caulis 5-20 dm. altus, proxime asprellus et radicans, distaliter fere nudus; folia verticillata, raro omnia dispersa, margine et subtus venis asprella, summa parva et remota; flores plerumque solitarii, raro plures, nutantes, sepalis recurvatis, 7.5-10 cm. longis, flavis, conspicue brunneo-maculatis; filamenta 4-6 cm. longa, late excurvata, antheris 1-2 cm. longis; stylus 3.3 cm. longus.[3]

---

[1] Colors in quotation-marks are according to Ridgway's " Color Standards and Color Nomenclature ".

[2] Rarely varying to red, careful search finding only a very few plants with red shading and but a single one with red perianth-segments. So far, all of the seedlings have been yellow-flowered or pink-stippled on a yellow ground.

[3] For the Latin diagnosis I am indebted to the editor.

Type, growing in sphagnum over black muck along wooded creek, about four miles north of Elberta, Baldwin County, Alabama, collected in flower August 1, 1946, by Mary G. Henry, no. 4464; deposited in the herbarium of the Academy of Natural Sciences of Philadelphia. This showed well the dark-spotted yellow perianth-segments.

In meadows near the Gulf Coast, from Baldwin County, Alabama, to Walton County, Florida. I have now found this at 20 stations, being 7 in Baldwin and 1 in Escambia counties, Alabama; and 3 in Escambia, 5 in Santa Rosa, 2 in Okaloosa and 2 in Walton counties, Florida. Flowering in August.

Our illustrations are of the plant growing in its native environment in southern Alabama and western Florida and under cultivation at Gladwyne, Pennsylvania; and also of the Alabama specimen selected for type. [Plates 1-5.]

Comparison with related species

The yellow turkscap flowers of *Lilium iridollae* can not be mistaken for those of any other lily of eastern North America. This new species is easily identified either in or out of bloom. In the swamps of western Florida and southernmost Alabama it seems to take the place of *L. superbum*. The latter I have seen growing in swamps of Butler, Montgomery, and Randolph counties, all farther inland in Alabama.[4] I have also seen it in Jackson County, Florida, while there is at the New York Botanical Garden a specimen of it from Leon County in that state. But *L. iridollae* is not of nearest kinship to *L. superbum*, and could not be mistaken for it. The yellow coloration and decided, though slight, fragrance of the flower, as well as the roughness on the veins and along the margins of the leaves, are all features that separate it from this wide-ranging eastern lily.

The flowers of *Lilium canadense*, the only other yellow-flowered lily in eastern North America, are bell-shaped, with spreading or only slightly recurved segments, very unlike the well-recurved turkscap flowers of *L. iridollae*. The obovate leaves, too, distinguish the latter from *L. canadense*. Finally, *L. iridollae* occurs only in sandy peat and in sphagnum bogs, whereas *L. canadense* prefers a less acid medium.

Lilium iridollae differs, too, from *L. michauxii*. The remarkably slender stem, the upper portion of which is nearly naked, and the much greater height of the plant, distinguish it, nor do the golden-yellow flowers with their slight fragrance recall the red strongly fragrant ones of that species. Also, the roughened leaves contrast with the glabrous ones of *L. michauxii*.

Furthermore, the habitats of these two lilies are different. While I have collected *Lilium michauxii* many times in the Carolinas, in Georgia, and in Alabama, as well as several times in Florida and once in Virginia,[5] I have never seen it in a swamp or bog. (It would be interesting to learn how it obtained its book-name of "Southern Swamp Lily"!) Always it has been growing in a dry well-drained soil, usually on a hillside, often in a ravine but always well above even the smallest stream. I have found it in the shade of trees, whereas *L. iridollae* occurs naturally in sphagnous meadows and along boggy creeks in sunshine. Occasionally I have seen the latter in semi-shade along the edges of meadows, in which its main growths had been destroyed by grazing.

---

[4] Charles Mohr does not include *Lilium superbum* in his " Plant Life of Alabama ", published in 1901.

[5] At its northernmost known station, five miles south of Hopewell, Prince George County.

Lastly, it differs from *Lilium michiganense.* This northern species has red perianth and ovate leaves, while it flowers in early July instead of in August.

Another marked character separates *Lilium iridollae* from all these other species. In August a cluster of narrowly linear leaves begins its growth on the bulb for the ensuing season. These leaves remain evergreen over winter and often last for more than a year. (Even seedlings, still in seed flat, make a few such narrow leaves.)

PRESENT STATUS

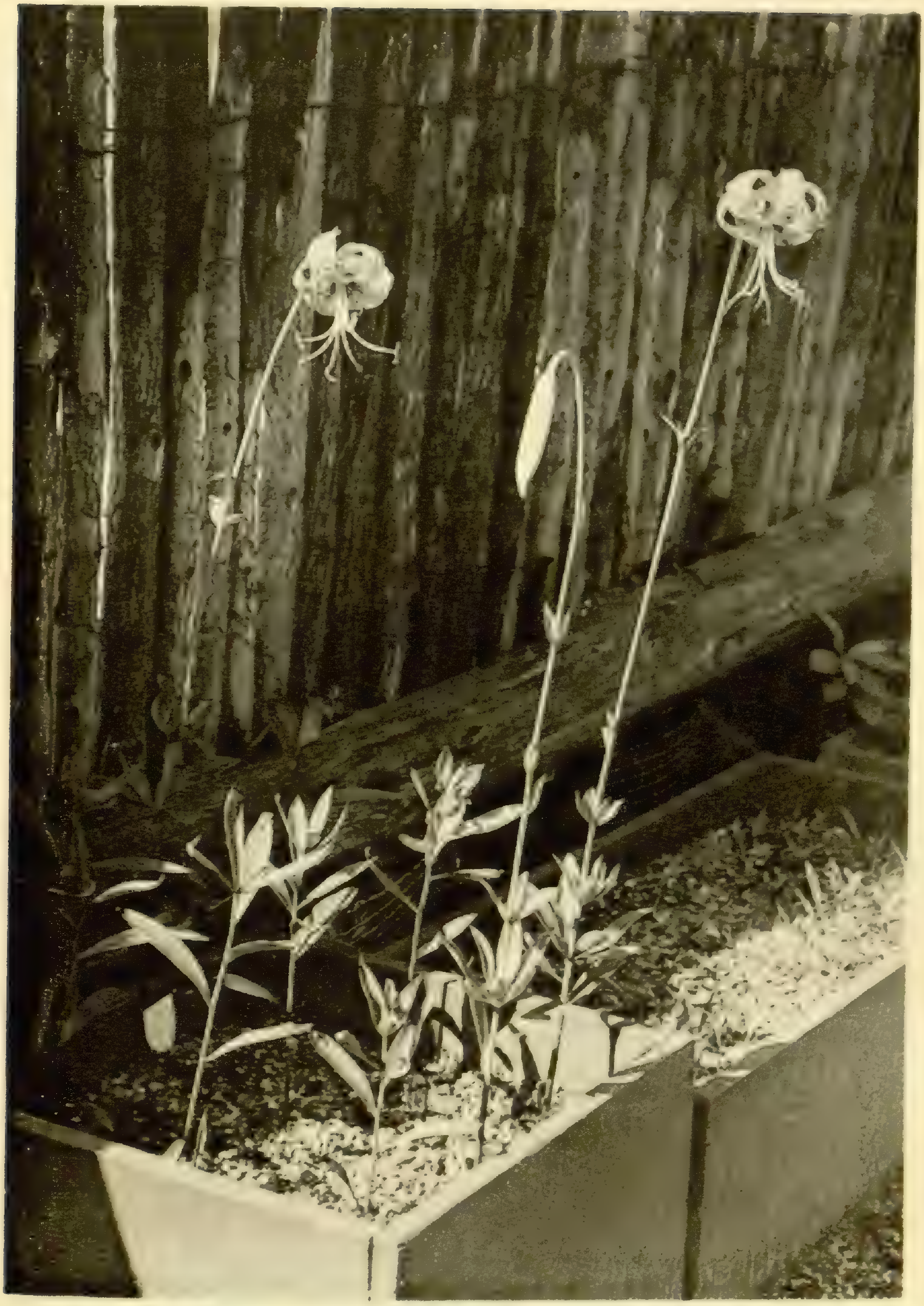
Lilium iridollae is now rather a rare lily. In the dry sandy pine lands that cover its range there is a farm house beside nearly every swamp, for swamps supply good "feed". Cattle are permitted to graze "at large",[6] and they roam freely, doing great damage as they are especially fond of the succulent stems and leaves of lilies. Hogs, too, which are very plentiful in some localities, are equally destructive, perhaps even more so, for they easily root up the delicate bulbs in the soft moist soil. In many of the localities where I found this lily, it was necessary to wander miles, wading through soft muck, rank vegetation and briers, before a single plant could be found.

After collecting many specimens in seed and in bud over a period of nearly six years, it was with a tremendous thrill, albeit in pouring rain, that I first saw *Lilium iridollae* in bloom in its native home. The sight of its beautiful yellow flowers, swaying gently on its slender stems, will remain one of the "high lights" of my life.

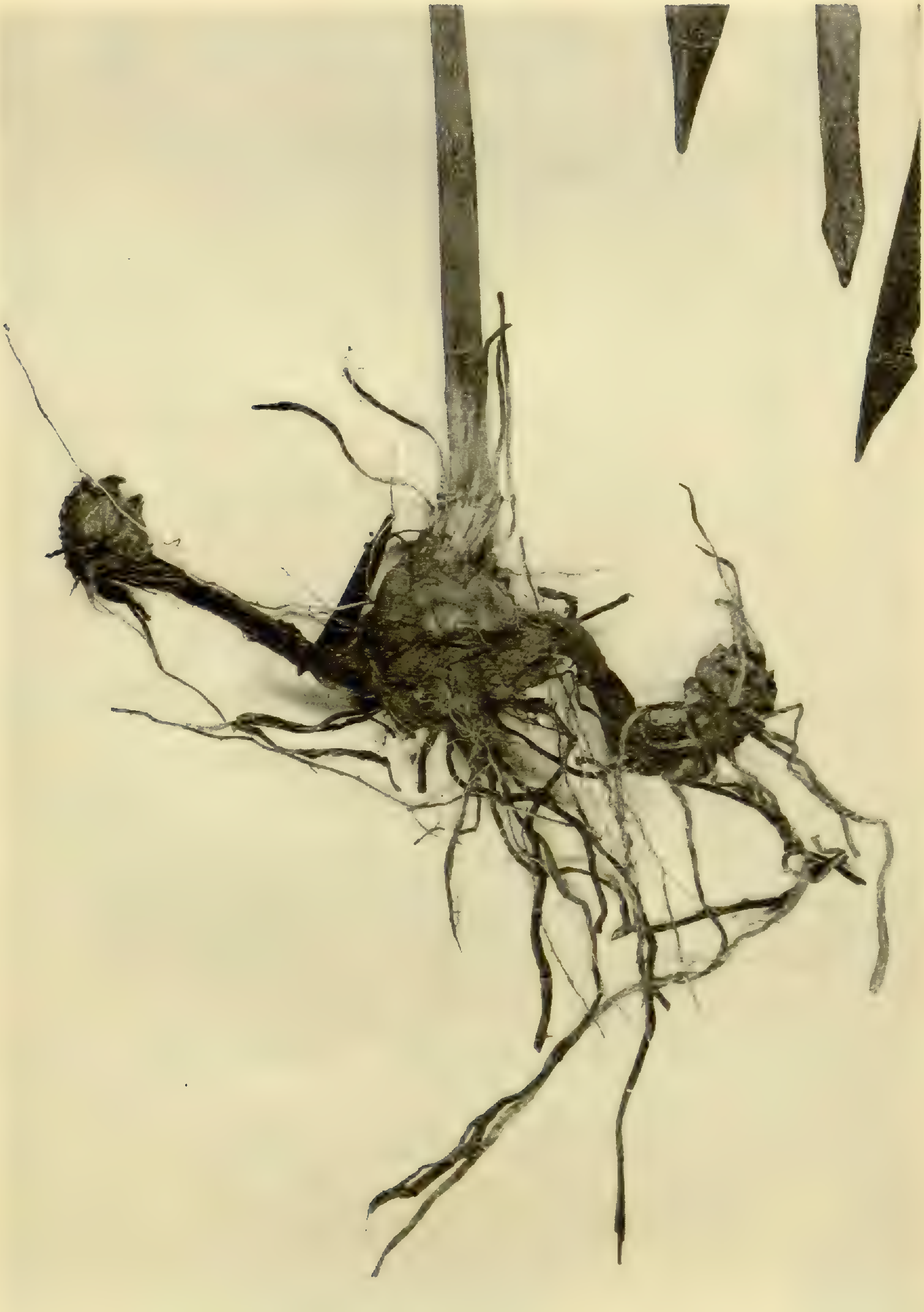
Alas, that this lovely lily should be vanishing from its native haunts even before it has become scientifically or horticulturally known!

---

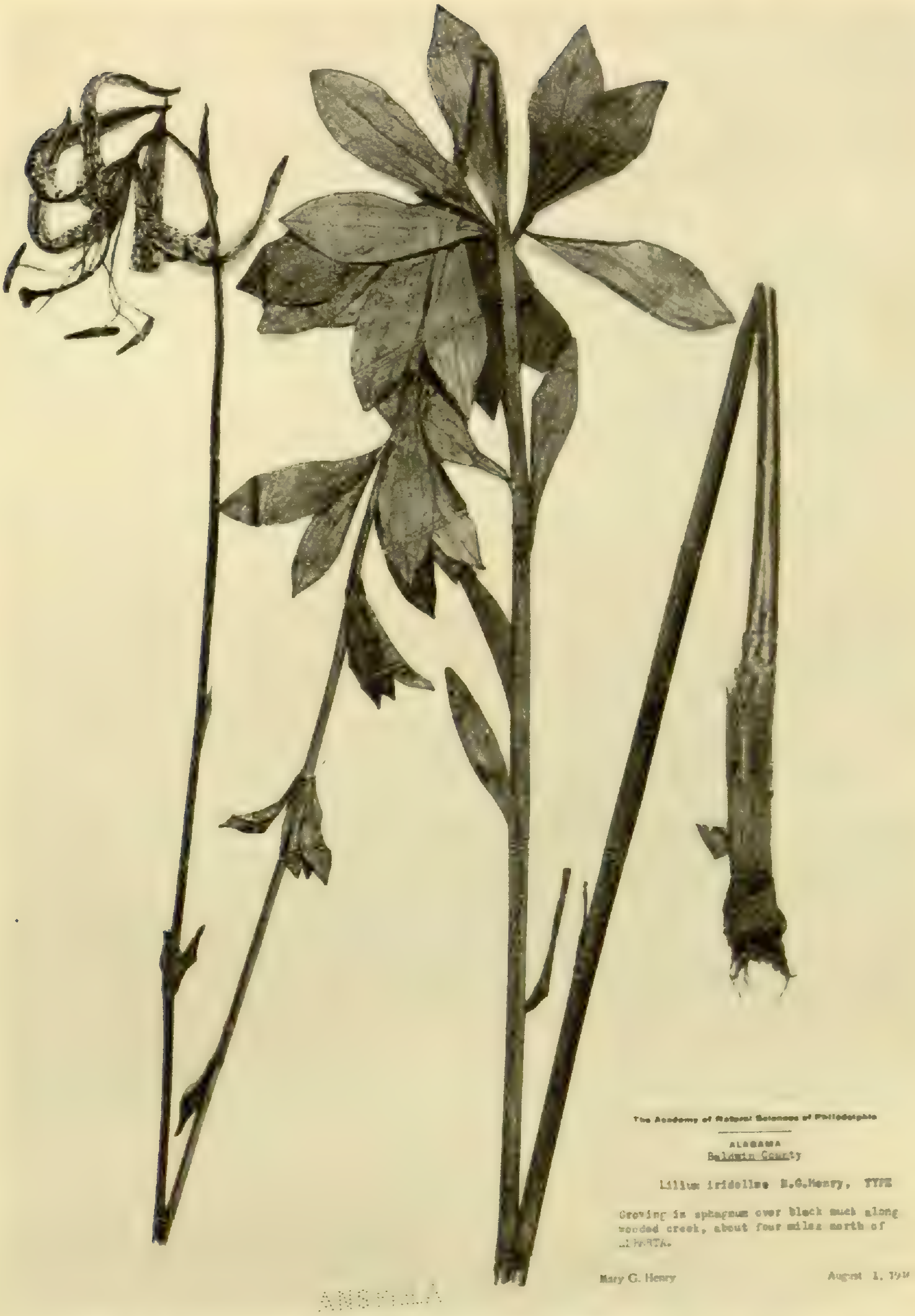
[6] It is to be hoped that botanists, horticulturalists and, indeed, all conservationists will bend their efforts to put an end to "cattle at large" before this lily and other choice native plants are completely destroyed.



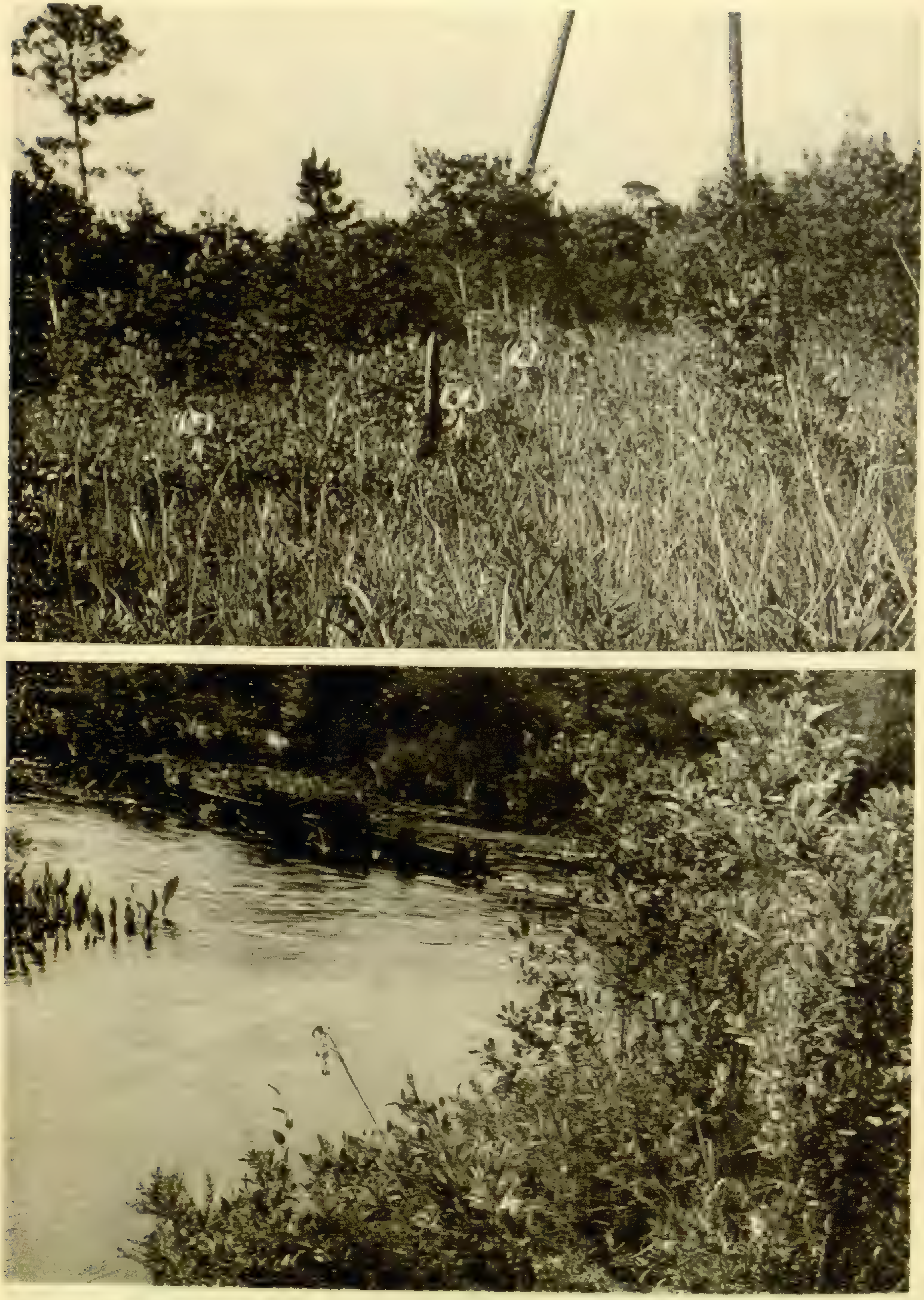
Lilium iridollae, grown at Gladwyne, Pa., from seeds gathered at type locality; flat of seedlings photographed by Mary G. Henry. The slender stems, nearly leafless above, are characteristic.



Lilium iridollae, from type locality, showing (life-sized) the small bulbs and the narrow basal winter leaves. Photograph by A. Delwin Warden.


The Academy of Natural Sciences of Philadelphia
ALABAMA
Baldwin County
Lilium iridollae M.G.Henry, TYPE
Growing in sphagnum over black muck along wooded creek, about four miles north of
Mary G. Henry
August 1

Lilium iridollae, from Baldwin County, Alabama. Type specimen photographed by A. Delwin Warden.



Lilium iridollae, in its native environment. Above, in a sphagnum bog in Baldwin County, Alabama, where growing with *Eriocaulon decangulare* and other plants. Below, on stream-bank in Okaloosa County, Florida. Photographs by Mary G. Henry.

A Key to the Eastern North American Lilies

Edgar T. Wherry

Published keys to our eastern lilies do not cover all the entities now recognized, and fail to allow sufficiently for variation. A new one has accordingly been constructed, using multiple diagnostic characters and noting cases of variability. For brevity, the term tepal is used instead of "perianth-segment." The measurements given refer to average plants at mid-anthesis; immature anthers are considerably larger than the sizes here assigned.

- FLOWER-POSITION erect; tepals clawed; corolla-hue red, or yellow in rare mutants.
  - LEAF-ARRANGEMENT alternate, ascending; tepals acuminate; range southern 1. *L. catesbaei*; ssp.:
    - BULB-SCALES slender, leafy-tipped; leaves linear or narrow-elliptic; tepal-blade length 3-6 × width; tepals decidedly recurved; capsule 4-8 cm. long, somewhat beaked; range chiefly far south and at low elevations northward.
      - STEM smooth throughout, with the leaves rather uniformly distributed over it; range wide .... a. *typicum*.
      - STEM rough and leafless the lower half of its length, with a prominent medial group of leaves; range w. Fla. to s. Miss. .... b. *asprellum*
    - BULB-SCALES thickish, scarcely leafy-tipped; leaves elliptic-oblong, acutish; tepal-blade length 2-3 × width; tepals but slightly recurved; capsule 3-6 cm. long, subtruncate at tip; range chiefly northward and at moderate elevations southward .... c. *longii*.
  - LEAF-ARRANGEMENT whorled at one or more nodes, spreading; tepals acutish; range northern .... 2. *L. philadelphicum*; ssp.:
    - WHORLS OF LEAVES present at but 1 or 2 nodes; leaf-outline linear to elliptic-lanceolate (f. *montanum*); length 3-8 cm., 7-10 × width; margins roughish to smooth (f. *lanceolatum*); capsule 4-8 cm. long; range midland .... a. *andinum*.
    - WHORLS OF LEAVES present at 3 to 6 nodes; leaf-outline narrow-elliptic to sublanceolate; length 3 (in f. *masseyi*) to 9 cm., 4-7 × width; margins roughish; capsule 2.5-5 cm. long; range eastward .... b. *typicum*.
- FLOWER-POSITION declined; tepals not clawed; leaves whorled at many nodes.
  - SEPAL-MIDRIB low, rounded; petal-midrib laterally rounded or narrowly ridged; anthers oblong, at maturity 6-12 or exceptionally 15 mm. long; stigma shallowly 3-lobed; leaf-margins and veins more or less roughened with spicules.
    - DECLINING OF FLOWERS moderate; tepals abruptly apiculate to short-acuminate, moderately divergent; leaf-spicules tending to be sparse; range, Appalachians, N. C. to s. W. Va. .... 3. *L. grayi*.
    - DECLINING OF FLOWERS marked; tepals gradually acuminate.
      - TEPALS moderately recurved; leaf-spicules tending to be copious, or sparse in rare mutants; blooming period late spring; range northeastern U. S. & adj. Can. 4. *L. canadense*; ssp.:
        - LEAF-LENGTH 5-10 × width; reflexing of tepals gradual; corolla-hue yellow, or red in occasional variants (f. *rubrum*); range chiefly east of Appalachians . a. *typicum*.
        - LEAF-LENGTH 2-5 × width; reflexing of tepals sub-abrupt; corolla-hue red; range chiefly in Appalachians .... b. *editorum*.

TEPALS strongly recurved.

LEAF-SPICULES tending to be copious, sparse or rarely lacking in mutants; outline elliptic to sublanceolate, acutish to acuminate; corolla-hue red, the tepal-bases bearing an inconspicuous green patch; blooming period late spring; range midland ....5. *L. michiganense.*

LEAF-SPICULES tending to be sparse; outline oblanceolate to obovate, obtusish, or elliptic and acutish in variants; corolla-hue yellow, or reddish in rare mutants, the tepal-bases bearing a conspicuous green patch; blooming period late summer; range w. Fla. & adj. Ala. ....6. *L. iridollae.*

SEPAL-MIDRIB elevated, bearing two erect sharp ridges; petal-midrib extended laterally into prominent ridges; tepals strongly recurved; corolla-hue red, or yellow in rare mutants; mature anthers linear, 12-24 mm. long; leaf-margins and veins smooth, or reportedly somewhat spiculate in rare mutants; blooming period late summer.

LEAF-OUTLINE elliptic-oblanceolate to obovate; base of tepals bearing an inconspicuous whitish patch; flowers decidedly fragrant; range, Gulf Coast to s. Va.
7. *L. michauxii.*

LEAF-OUTLINE linear- to oblong-elliptic; leaf-length less than 10 × width (or up to 20 × width in a Fla. form) base of tepals bearing a conspicuous green patch; flowers faintly to moderately fragrant; range w. Fla. to s. Ind. & e. Mass. ....8. *L. superbum.*

The taxonomy and nomenclature of the above key now require brief discussion.

1. *Lilium catesbaei* Walter, Flora caroliniana: 123, 1788. This widespread southern lily was long regarded as non-variant, but a " marked variety " was recently distinguished by Fernald. An equally distinct yet intergrading variant occurring along the Gulf coast remains to be named.

a. ssp. **typicum,** nomen novum pro plantam originariam in stato subspecei. The original entity of Walter. As it is illogical to contrast a whole object with a part of itself, the segregation of a variety or subspecies requires a corresponding designation for the part including the type.

b. ssp. **longii** (Fernald) Wherry, stat. nov. *L. catesbaei* var. *longii* Fernald in Rhodora 42: 443, 1940. The extent of the differences shown by this entity, and of its geographic segregation, would lead the modern taxonomist to assign it subspecific rank.

c. ssp. **asprellum,** nova. Stem leafless and markedly roughened for the lower half of its length, with numerous leaves crowded in a conical grouping about the middle of the stem.

Caulis aphyllus et proxime asprellus, foliis ad mediam caulis confertis.[1]

Type, Biloxi, Harrison Co., Miss., *F. W. Pennell* 4377, Aug. 28, 1912, in herbarium University of Pennsylvania.

Other collections: Elberta, Baldwin Co., Ala., *Mary G. Henry* 2444; south of Marianna, Jackson Co., Fla., *Henry* 3164; and 3 m. nw. of Chumockla, Santa Rosa Co., Fla., *Henry* 3146, all in herbarium Academy of Natural Sciences of Philadelphia. Intermediates with the bare portion of the stem shorter and smoother are represented in collections from elsewhere in the same regions.

2. *L. philadelphicum* L. Spec. plant., ed. 2: 435, 1762. In this case two variants have long been recognized, some workers considering them specifically distinct, others uniting them in one way or another.

---

[1] Latin diagnosis prepared by the editor.

a. ssp. *typicum,* nomen novum pro plantam originariam in stato subspecei. To be applied to the original entity when subspecies are under discussion. Beside the typical form, there is also f. **masseyi** (Hyams) Wherry, stat. nov. *L. masseyi* Hyams in Bot. Gaz. 28: 431, 1899. This is the short-leaved variant found in especially bleak situations.

b. ssp. *andinum* Ker-Gawler. (symbol β used instead of "ssp.") This entity was first named *L. andinum* by Nuttall in a dealer's catalog without description, in 1813. A year later Pursh named it *L. umbellatum.* Then in 1818 Nuttall validated his epithet by publishing a description (Gen. N. Am. Pl. 1: 221, 1818). Upon assignment to infra-specific status, Ker-Gawler in Bot. Reg. 7: pl. 594, 1822, used the Nuttall epithet.

There are several significant named forms: (1) f. **montanum** (Nelson) Wherry, stat. nov. *L. montanum* Nelson, in Bull. Torr. Bot. Club 28: 6, 1899. *L. philadelphicum montanum* Cockerell ex Daniels in Univ. Missouri Stud. 2: 92, 1911. This seems to differ from the typical Nuttall entity in its more robust habit and broader leaves, corresponding to occupancy of moister soils. (2) f. **lanceolatum** (Fitzpatrick) Wherry, stat. nov. *L. lanceolatum* Fitzpatrick in Proc. Iowa Acad. Sci. 14: 131, 1907. This differs from the preceding form in having the leaf-margins smooth. (3) f. *flaviflorum* Williams in Rhodora 15: 217, 1913; the yellow color-form. (4) f. *pulchrum* Aldrich ex Cockerell in Sci. Gossip 25: 189, 1889 (as var. under *L. philadelphicum*); *immaculatum* Raup in Contr. Arnold Arb. 6: 138, 1934; both referring to the unspotted mutant of the western subspecies.

3. *L. grayi* S. Watson in Proc. Amer. Acad. Arts & Sci. 14: 256, 1879. While this lily is variable, its segregation into subspecies has not as yet proved practicable. It grades imperceptibly into *L. canadense.*

4. *L. canadense* L., Spec. plant.: 303, 1753. The wide-ranging Meadow Lily is markedly variable, and will perhaps ultimately be segregated into a number of infra-specific entities. The following are noteworthy:

a. ssp. *typicum* Wherry, nomen novum pro plantam originariam in stato subspecei. The corolla-hue varies from yellow (known as hort.-var. *flavum* Kunth designated f. *flavum* Marie-Victorin in Contr. Lab. Bot. Univ. Montreal 14: 15, 1929) to red, the latter constituting f. *rubrum* Britton in Bull. Torr. Bot. Club 17: 125, 1890. (Known as hort.-var. *coccineum* Kunth).

b. ssp. **editorum** (Fern.) Wherry, stat. nov. *L. canadense* var. *editorum* Fernald in Rhodora 45: 393, 1943. This variant occurs in dryer situations than ssp. *typicum;* in Deam's Flora Indiana: 313, 1940 where it is classed as f. *rubrum,* the habitat is well characterized as "rocky wooded slopes." The soil moreover may be more acid, as shown by Deam's record of its association with *Vaccinium vacillans.*

5. *L. michiganense* Farwell in Bull. Torr. Bot. Club 42: 353, 1915. Long confused with both *L. canadense* and *L. superbum,* this lily perhaps deserves segregation. However, the variants named by Farwell are regarded as connected with the amount of nourishment available to the bulbs, so should become:

f. **peramoenum** (Farw.) Stokes in Lily Yr. Bk. 1935; *L. peramoenum* Farwell, loc. cit. The variant with especially numerous leaves and flowers, corresponding to growth in rich, moist soil.

f. **umbelliferum** (Farw.) Wherry, stat. nov. *L. m.* var. *umbelliferum* Farwell, loc. cit. Characterized by having several flowers in a solitary umbel (the typical form bearing about two umbels).

f. **uniflorum** (Farw.) Wherry, stat. nov. *L. m.* var. *uniflorum* Farwell, loc. cit. The solitary flower corresponds to immaturity or to impoverishment of the substratum.

The Midland Lily differs from the Meadow Lily only in the extent to which its petals reflex, and could readily be classed as merely another subspecies of the latter. As it agrees consistently with *L. superbum* only in this one respect of reflexed petals, the writer is unable to understand the view of Hull in Rhodora 44: 220, 1942, and 45: 512, 1943, as to their identity. His views in this matter were published in Rhodora 44: 453, 1942, and may be summarized by stating that the two differ fundamentally in bulb-, leaf-, sepal-, petal-, and stamen-characters.

6. *L. iridollae.* Described by Mrs. Henry on an earlier page. This is similar to *L. canadense* in spiculate leaf-surfaces and in the yellow flower-hue, to *L. michiganense* in recurved tepals, to *L. michauxii* in oblanceolate leaves, and to *L. superbum* in the prominent green patch at the base of each tepal.

7. *L. michauxii* Poiret in Lamarck's Encyclopedia, Suppl. 3: 457, 1813. (Widely known as *L. carolinianum* Michaux, 1803 or *L. superbum* var. *carolinianum* (Michx.) Chapman, 1860, but not *L. carolinianum* Bosc, 1789, a synonym of *L. catesbaei* Walt.) This lily varies moderately in leaf-outline, and intermediates with *L. superbum,* which may be hybrids, are occasionally found. Two misunderstandings about it on the part of many horticultural writers should be pointed out, namely that it is a denizen of swamps and that it is characteristic of the deep south. The writer has observed dozens of colonies of it from near sea-level to at least 2500 feet elevation in the Appalachians, and they were always on dry slopes, never in any sort of swamp. And it is by no means limited to far southern lands; Mrs. Henry has found it up to 5 miles south of Hopewell, Prince George Co., Virginia, thus to 37° 15′ north latitude, and the writer has seen it nearly as far north in the high mountains around Pulaski, so it is obviously winter-hardy.

8. *L. superbum* L., Spec. plant. ed. 2: 434, 1762. The range assigned to this lily in manuals is usually too wide, both *L. canadense editorum* and *L. michiganense* being mistakenly included under it. Specimens are preserved in our larger herbaria only from western Florida to southern Indiana and to eastern Massachusetts. No variants will here be named, but mention may be made of a form found in western Florida by Mrs. Henry which has especially numerous, long, narrow leaves and blooms in autumn. There are also striking color-forms, ranging even to pure yellow without purple spotting, which have thus far been assigned only horticultural names.

A Collection of Plants from Yakutat, Alaska

Leslie D. Stair and Francis W. Pennell

In southeastern Alaska, just where the Pacific coast makes a broad bend from east to southeast, the St. Elias Range, with the fronting Brabazon and Fairweather Ranges, runs so near it that at various places glaciers descend nearly or quite to the sea. In the middle of this stretch a broad bay extends inland and as a narrow prolongation penetrates the high ranges, behind and among which a tortuous fiord extends southeastward for many miles. The broad bay is Yakutat Bay, its narrow prolongation is Disenchantment Bay, while the fiord is Russell Fiord.

But, though dominated by mountains, the country is not wholly rugged. On the southeastern side of Yakutat Bay, in part separating it from the ocean, is a wedge-shaped belt of flat glacial-outwash plain, that some fifty miles southeastward tapers to its point and disappears where the mountains again touch the sea. As the base of this wedge is nearly twenty miles wide, this isolated flat-land must comprise almost 500 square miles. Yakutat village, the only real settlement in some three hundred miles of coast, is situated on this flat terrain just within the mouth of Yakutat Bay.

It is natural that such a spot should have been rarely visited by botanists. Dr. Eric Hultén's recent record of botanical collectors in Alaska[1] mentions but eight certain visits, most of which were for only a few days or weeks. He lists the following: from June 27 to July 5, 1791, Thaddeus Haenke and Luis Nee on Malaspina's Expedition; in 1880, perhaps William H. Dall in the course of a survey of the coast from Sitka to Unalaska, although Hultén cites no specimens of his from Yakutat; from May 19 to September 4, 1892, Frederick Funston, for the United States Department of Agriculture; from June 18 to 23, 1899, the Harriman Expedition, which included Frederick V. Coville, Thomas H. Kearney, William Trelease, and six others; from August 31 to September 2, 1904, Charles V. Piper; in July, 1907, D. S. Birkett; in August, 1908, Edmund Heller and Mrs. Kate Stephens; in June, 1909, Albert S. Hitchcock;[2] in 1913 George B. Rigg, on the U. S. Kelp Expedition; and in June, 1922, Ernest P. Walker[2] of the U. S. Bureau of Fisheries.

---

[1] " History of botanical explorations in Alaska and Yukon territories from the time of their discovery to 1940 ", in Meddelanden från Lunds Botaniske Museum, Nr. 50, 1940. Based in part on data previously assembled by Paul C. Standley.

[2] As evidenced by citations of various grasses in Hultén's " Flora of Alaska and Yukon ", although Yakutat does not appear in the presentation of Hitchcock's itinerary. Similarly, the evidence of Walker's visit depends upon such citations, Yakutat not appearing among the places at which he was reported to have collected.

Of these much the most important work was done by Frederick Funston.[3] He made an ample collection of flowering plants and ferns, which formed the basis of a special account of the flora by Frederick V. Coville. This, entitled " Botany of Yakutat Bay, Alaska ",[4] enumerates, with notes of occurrence, 125 species of flowering plants, 9 of Pteridophytes, and 25 of Bryophytes. Coville's " Botanical Report " is prefaced by Funston's " Field Report ", in which Funston tells of his experiences and gives a general view of the country and its vegetation. He found Yakutat peopled only by Thlinket Indians whom he considered " uncivilized ", but with their help and that of his personal assistant he was able to collect at various places about the bay and up on the mountain slopes to snow. He hardly entered the flat lowland, describing it as " covered with a forest growth practicably impenetrable ". Specimens were collected in sets of twenty, the task being exceedingly difficult because of the continual dampness: " the drying papers were changed two or three times every day and dried by hand over a fire before they were returned to the presses ". Funston's is our best account of the plant-life, and Coville's has been our only enumeration of its component species, Coville remarking that " the specimens collected undoubtedly represent nearly all the species of vascular plants that occur in the area traversed ".[5]

Later visits, notably those of the Harriman Expedition in 1899 on which Coville himself was present, of Piper in 1904, and of Hitchcock in 1909, have added occasional species. That of Rigg in 1913 was especially devoted to Bryophytes; although there has been no actual report of the species obtained, Hultén lists several ecological papers by Rigg that deal with the bogs and muskegs of southeastern Alaska. His collections are presumably at the University of Washington.

The twenty-five years from the visit of Funston to the outbreak of the First World War formed a period of keen interest in the study of the Alaskan flora. This led to the preparation of a Flora of Alaska and Yukon by Paul C. Standley, a work that lay long shelved at Washington and was later abandoned. Only in the last decade has the project been taken up again, and now we have two Floras, each in process of serial publication. Mr. Jacob P. Anderson, who was long resident at Juneau and has traveled extensively over much of the territory, is bringing out his " Flora of Alaska and adjacent parts of Canada ";[6] while Dr. Eric Hultén, who has intimate field-knowledge of the plants of Kamchatka and the Aleutian Islands (concerning both which areas he has published Floras), is similarly producing his " Flora of Alaska and Yukon ".[7] Both works follow the same sequence and both have now either reached or are approaching the Rosaceae, up to which point we have depended upon them for aid in identifications. Hultén's is more thorough in its taxonomy and bibliography, while it has the great advantage of giving detailed citations of specimens accompanied by maps that show the occurrence of each species in these territories. On these, each locality is shown by its appropriate dot. Hultén's nomenclature is that adopted in our present report.[8]

---

[3] It is interesting that this man, who, later, as a soldier, leaped to fame through the dramatic capture of Aguinaldo in the Philippines and ultimately became general-in-chief of the United States Army, should have been early in life a botanical collector.

[4] Contrib. U. S. Nat. Herb. 3: 325-363, 1896.

[5] Although Funston evidently attempted to collect all flowering plants, ferns, and mosses, he seems to have failed to discriminate sufficiently among the grasses, sedges, and rushes, and among the mosses. Moreover, while he tells of gathering smaller sets of such plants as were not sufficiently plentiful, one suspects that he would likely miss some species by passing them by in expectation of finding them more plentiful elsewhere or later. As Coville's report contains no naturalized plants, one wonders whether weeds were ignored, or if, more probably, they were not actually absent under the primitive conditions Funston encountered. They are still few.

With this introduction, we come to the purpose of the present paper. It is to tell of the visit of one of us to Yakutat Bay in 1945, and to record the flowering plants and ferns obtained. Of this visit, apparently the first botanical foray to this bay for more than twenty years, let Mr. Stair speak alone.

" My own visit to Yakutat, from July 7th to 23rd, 1945, was for the indulgence of my favorite hobby, moss-collecting. I had hoped to search the mountain meadows, between tree and snow lines, both at the head of Yakutat Bay and above Disenchantment Bay, but that was impossible because everybody and every boat was busy salmon-fishing. In a way, that proved fortunate since I had to give my attention to the virgin forests and the muskegs beyond them. Earlier collectors had found these areas impenetrable because of the dense spiny masses of devil's club (*Echinopanax*).

" But in 1945 I found that the Army Air Corps had bulldozed roads from the village through the forest to the ocean beach and to the muskeg where an airport had been built. They had also cleared sites for camps and housing areas. These roads now gave access to areas formerly almost inaccessible, so that I could supplement, rather than repeat, the work of previous collectors.

" The terrain around Yakutat is a glacial plain or flat, fairly level, ranging up to eighty feet above sea-level. The soil is a coarse glacial detritus. Much of this plain between the sea and the mountains is covered by dense coniferous forest that is formed by only two species, Sitka spruce (*Picea sitchensis*) and western hemlock (*Tsuga heterophylla*). These trees average about two feet in diameter and about seventy feet tall, and they are covered with mosses to their very tops. The only other trees are small willows and alders from 12 to 15 feet tall that grow along the creeks and the shores of the bay. The rest of the area is mostly muskeg interspersed with many creeks and ponds, where the salmon run to spawn. The thickets along the forest-edges and on banks are very dense, consisting of devil's club (*Echinopanax horridum*), elder (*Sambucus racemosa pubens*), and salmonberry (*Rubus spectabilis*).

---

[6] Iowa State Coll. Journal of Science 18: 137-175, 1943, and subsequent numbers. A map of Anderson's collecting stations shows us that he was never at Yakutat.

[7] Lunds Universitets Årsskrigt N. F. Avd. Bd. 37, 1941, and subsequent numbers.

[8] So far as Hultén's " Flora of Alaska and Yukon " has been issued, it has been simple to take it for our standard, but beyond the Rosaceae our names are less confidently presented. We have, however, relied upon his previous " Flora of the Aleutian Islands " for all species that appear therein; while we have been greatly aided by a series of Anderson's specimens that is at the Academy of Natural Sciences of Philadelphia.

" There were only two clear days in the sixteen that I spent at Yakutat. On the other days it rained, though seldom heavily; usually it drizzled, and was misty rather than foggy. The average rainfall totals about 140 inches a year.

" At the time of my arrival, daylight was such that one could read for all but an hour and a half out of a 24-hour day, Yakutat being in the same latitude as the southern tip of Greenland. Because of the long days, the rate of growth of many of the flowering plants was astonishing to a checkako, as some plants only in bud on Monday would be in seed on Saturday! It required daily collecting to procure specimens in the desired condition.

" The warmest day when there was 63° Fahr. The average temperature during the day was 56°, and at night it did not fall below 46°. This even range of temperature was very agreeable. The winters are not severe, for it seldom drops below 5°, but the snowfalls are heavy. My collecting was done in the rain, but, if properly dressed, one did not mind that. Specimens were brought in dripping wet, but, as I had been given an empty house that was oil-heated, the problem of plant-drying was easily solved. Another fortunate circumstance was that there were no insect pests, as is so often the case in northern latitudes.

" The men of the Air Corps and those of the Civil Aeronautics Administration went out of their way to save steps and time by taking me to and from destinations by car, jeep or truck. Due to such aid, much more ground was covered in nine actual days of collecting than would have been otherwise possible. This is evidenced by the following list of 186 species of flowering plants and ferns from the Yakutat area.

" My original plan of collecting only Bryophytes and such flowering plants as had been specially requested was changed when I realized the uniqueness of the opportunity that was mine at Yakutat. That the change was warranted is shown by the number of plants now reported additional to those found by Funston in 1892. For these come largely from terrain that was impenetrable to him."

The list of plants collected by Mr. Stair in 1945 contrasts strongly with that of Coville based upon Funston's collections of 1892. Pteridophytes are fewer in number, 9 having been gotten by Funston, whereas Stair found only 6 or 7. Of course, the Bryophytes gathered by Stair far exceed the 25 procured by Funston; these plants are not enumerated now, but are to be reported in detail later. But most surprising is the great increase in the number of flowering plants, since Funston had also given main attention to them.[9] Stair found 176 species, an increase of 51 over the 125 of Coville's list. Moreover, he failed to find 48 species that Funston gathered, most being plants of higher levels. Actually, 99 of Stair's 176 species, nearly 3/5, are additional to Funston's findings. These are marked by asterisk (*) on the following list.

---

[9] Checking the identifications of Stair's plants against Coville's list involves difficulties resulting from changed taxonomic concepts and procedures; however, we think that this has been safely accomplished, and on the following list any different names reported by Coville are added in brackets.

But some of these starred species, 17 to the end of Rosaceae, while not on Coville's list, are reported by Hultén to have been subsequently gathered by other botanical visitors to Yakutat. In each of these cases we are now stating to whom their first collection at Yakutat should be assigned. Allowing for a like proportion in the remaining families, it seems probable that about 30 species have been found at Yakutat additional to those gathered by Funston in 1892 and previous to Stair's visit in 1945. This leaves 70 as a conjectural total of the latter's additions to the list of flowering plants known there.

These species are our first real record of the flora of the forest and muskeg at Yakutat. But from the last figure one should deduct the total of the naturalized plants, those with names printed in italics on the following list. It seems probable that these are nearly or all immigrants since the Army Air Corps commenced its activities some five or six years ago. Doubtless certain supposedly native species have also profited by the new man-made environments, and should be added to those that are unquestionably introduced. Deducting the figure for the latter, 11, from 70, leaves 59.

One other species must be counted out. Curiously enough, the single plant brought to Mr. Stair from Disenchantment Bay, *Silene acaulis,* was not on Coville's record. This leaves us about 58 or actually likely about 50, species as indigenous components of the Yakutat flora, which occur on the flat coastal lowland, and which are now reported from Yakutat for the first time.

With this last exception, the actual number of indigenous species of flowering plants gathered in 1945 at Yakutat is 168. Broadly, these pertain to two groups, those that are widespread over boreal North America, and those that are peculiarly western. The former group, comprising the species designated by dagger (†) on the list below, numbers 85 species or subspecies, of which some 60 reach the northeastern United States.

In contrast to them the remaining 84 species or subspecies are wholly western on this continent. Some occur extensively through coastal or mountain areas southward to the western United States. Many belong definitely to the protected Alaskan coastland from the archipelago of southeastern Alaska to the Aleutian Islands; [10] a few to but a portion of this, the most restricted appearing to be *Rhinanthus arcticus,*[11] so far as known confined to Yakutat. Others again are species of northern Asia that reach their eastern limits in this area. On the following list the wholly western species remain unmarked, except that those whose known ranges are now being extended northwestward to Yakutat are marked by " W ", while those being extended eastward to Yakutat are marked by " E ".

---

[10] On Hultén's maps many of these species have been severed into eastern and western portions that can now be interconnected by an intermediate dot for Yakutat. Such species spread inland to each side, but not from the coast that is dominated by the St. Elias Range.

[11] Evidently, to the Austrian proposer of this name for a new species based upon a collection of Funston's from Yakutat Bay, all Alaska was Arctic!

The ecological occurrences of these species may be summarized as follows: in virgin forest, 16; along edges of forest, 9; on muskeg, 47; in thickets, 7; along edges of ponds, 6; on creek banks, 13; immersed in creeks and ponds, 6; on pebbly bay shores, 11; on sandy ocean beaches, 15; on cleared ground, 18; on roadside banks, 27; in roadside ditches, 7; on railroad right of way, 7.

The specimens, collected at Yakutat in 1945, are deposited in the herbarium of the Academy of Natural Sciences of Philadelphia. They are reported by species on the following list, the species being grouped under families in the familiar sequence of recent manuals as of Anderson's and Hultén's Floras. For assistance in checking and correcting identifications of Pteridophytes, comprising the first three families, we are indebted to Mr. George R. Proctor, of the Academy's Botanical Department.

POLYPODIACEAE	
*† Athyrium filix-femina cyclosorum (Rupr.) C. Chr.	On ground in virgin forest
Cystopteris fragilis (L.) Bernh.	" " " " "
† Dryopteris austriaca (Jacq.) W., S. & T. [D. spinulosa (Retz.) Kuntze]	" " " " "
† Dryopteris linneana C. Chr. [Phegopteris dryopteris (L.) Fee]	" " " " "
Polypodium vulgare occidentale Hook. [P. vulgare L.]	On trees in virgin forest
EQUISETACEAE	
Equisetum arvense L.	Roadside banks
" variegatum alaskanum (Eaton) Hult. [E. variegatum Schleich.]	Muskeg
LYCOPODIACEAE	
† Lycopodium annotinum L.[12]	Edge of woods
PINACEAE	
Picea sitchensis (Bong.) Carr.	Virgin forest
Tsuga heterophylla (Raf.) Sarg. [T. mertensiana (Bong.) Carr.]	" "
POTAMOGETONACEAE	
*† Potamogeton perfoliatus richardsonii (Benn.) Hult.	Immersed in creek (Piper)
*† Potamogenton pusillus L.	" " "
SCHEUCHZERIACEAE	
*† Triglochin maritimum L.	Muskeg
POACEAE	
*† Agrostis alaskana Hult.	Muskeg and cleared ground (Piper)
*† Alopecurus aequalis Sobol.	Creek banks (Trelease)
† Calamagrostis canadensis langsdorffii (Link) Inman [C. langsdorffii (Link) Trin.]	Cleared ground
*† Calamagrostis neglecta (Ehrh.) M. & S.	Muskeg
† Elymus arenarius mollis (Trin.) Hult. [E. arenarius	

---

[12] Mr. Stair collected also *L. a. pungens* (Pylaie) Desv., not separately mapped by Hultén, who states that it is dominant inland but rare on the coast. G. R. P.

L.]	Sandy ocean beach
* Elymus hirsutus Presl	Creek banks[13]
* Festuca rubra L.	Muskeg
* Glyceria pauciflora Presl	Roadside banks (Coville & Kearney)
† Hierochloe odorata (L.) Beauv. [Savastana odorata (L.) Scribn.]	Muskeg
* Hordeum brachyantherum Newski	Creek banks
* " *jubatum* L.	Roadside banks
† Phleum alpinum americanum Fourn. [P. alpinum L.]	Sandy ocean beach
* Poa *annua* L.	Roadsides (Hitchcock)
" eminens Presl [P. glumaris Trin.]	Pebbly bay beach
Puccinellia nutkaensis (Presl) F. & W. [P. maritima (Huds.) Parl.]	Roadside banks
* Trisetum cernuum Trin.	Cleared ground (Piper)
* Vahlodea atropurpurea paramushirensis (Kudo) Hult.	Cleared ground

CYPERACEAE

*† Carex brunnescens (Pers.) Poir.	Cleared ground
*† " canescens L.	Roadside ditches
*† " capillaris L.	Muskeg
*† " flava L.	" (Piper)
*† " garberi bifaria Fernald	"
* " gmelini H. & A.	Cleared ground
" hindsii Clark [C. decidua Boott]	Creek banks
† " macloviana pachystachya (Cham.) Hult. [C. festiva pachystachya Bailey]	Railroad right of way
* " macrocephala anthericoides (Presl) Hult.	Sandy ocean beach (Walker)
* " mertensii Prescott	Cleared ground
*†W " oederi viridula (Michx.) Kük.	Muskeg
* " phyllomanica W. Boott	"
* " physocarpa Presl	"
" pluriflora Hult. [C. limosa stygia (Fries) Bailey]	Roadside ditches
*† Eriophorum angustifolium scabriusculum Hult.	Muskeg
*† " scheuchzeri Hoppe	Cleared ground
*† Scirpus caespitosus austriacus (Palla) A. & G.	Muskeg

ARACEAE

* Lysichitum americanum Hult. & St. John	Creek banks (Rigg)

JUNCACEAE

*† Juncus alpinus nodulosus (Wahlenb.) Lindm.	Muskeg
*† " bufonius L.	Pebbly bay shore
" falcatus sitchensis Buchen. [J. f. alaskensis Coville]	Muskeg
* " mertensianus Bong.	Cleared ground
*† " triglumis L.	Muskeg (Coville & Kearney)
† Luzula multiflora (Retz.) Lejeune [Juncoides campestre sudeticum (Willd.) Coville]	Muskeg & virgin forest
* " parviflora divaricata (S. Wats.) Hult.	Forest & cleared ground

LILIACEAE

* Majanthemum dilatatum (Wood) N. & M.	Virgin forest
Streptopus amplexifolius (L.) DC.	Roadside banks
Tofieldia occidentalis S. Wats. [T. glutinosa (Michx.) Pers.]	Muskeg
* Veratrum eschscholtzii A. Gray	Wet shady swales

[13] Type collected in Yakutat Bay by Haenke in 1791.

IRIDACEAE		
	Iris setosa Pall.	Muskeg
ORCHIDACEAE		
*W	Corallorhiza mertensiana Bong.	Virgin forest
*W	Listera caurina Piper	“ “
*†	“ cordata nephrophylla (Rydb.) Hult.	“ “
†	Platanthera dilatata (Pursh) Lindl. [Habenaria dilatata (Pursh) Hook.]	Muskeg
	Platanthera stricta Lindl. [H. hyperborea (L.) R. Br.]	Muskeg & creek banks
SALICACEAE		
*†	Populus tacamahacca Mill.	Sandy ocean beach [14]
*	Salix lasiandra lancifolia (Anders.) Bebb	Creek banks
*	“ sitchensis Sanson	Roadside banks (Coville & Kearney)
MYRICACEAE		
*	Myrica gale tomentosa C. DC.	Muskeg
BETULACEAE		
	Alnus crispa sinuata (Regel) Hult. [A. rubra Bong.]	Banks of bay
URTICACEAE		
*†	Urtica gracilis Ait.	Roadside banks
POLYGONACEAE		
†	Polygonum viviparum L.	Muskeg
*	*Rumex acetosella* L.	Roadside banks
*	“ *domesticus* Hartm.	“ “
CHENOPODIACEAE		
*	Atriplex gmelini C. A. Meyer	Pebbly bay shore
CARYOPHYLLACEAE		
*	*Cerastium caespitosum* Gilib.	Cleared ground
	Honckenya peploides major (Hook.) Hult. [Arenaria peploides L.]	Sandy & pebbly shores
†	Moehringia lateriflora (L.) Fenzl [Arenaria lateriflora L.]	Grass at top of sandy ocean beach
*	Sagina crassicaulis S. Wats.	Pebbly bay shore
*†	Silene acaulis L.	Rocks at Disenchantment Bay [15]
*†	Spergularia canadensis (Pers.) Don	Pebbly bay beach
*	Stellaria crispa C. & S.	Cleared ground (Coville & Kearney)
*†	“ humifusa Rottb.	Pebbly bay shore
*†	“ sitchana bongardiana (Fern.) Hult.	Cleared ground
NYMPHAEACEAE		
	Nuphar polysepalum Engelm. [Nymphaea polysepala (Engelm.) Greene]	Pond
RANUNCULACEAE		
	Aquilegia formosa Fisch.	Muskeg
	Caltha palustris asarifolia (DC.) Huth [C. palustris L.]	Creek banks
*	Coptis asplenifolia Salisb.	Roadside banks
†	“ trifolia (L.) Salisb.	Woods at edge of pond
	Ranunculus bongardii Greene [R. nelsonii (DC.) Gray]	Roadside banks

[14] Only a single tree seen.

[15] Gathered by George Nelson.

*† Ranunculus cymbalaria Pursh	Creek shores
† “ reptans L.	Running ditch & muskeg
* “ septentrionalis pacificus Hult.	Roadside banks (Piper)
*† “ trichophyllus (Chaix) Schultz	Immersed in creek
* Thalictrum sparsiflorum richardsonii (Gray) Boivin[16]	Creek banks

BRASSICACEAE

Arabis hirsuta eschscholtziana (Andrz.) Hult. [A. hirsuta (L.) Scop.]	Top of sandy ocean beach
* Cakile edentula californica (Heller) Hult.	Sandy ocean beach
* *Capsella bursa-pastoris* (L.) Medic.	Roadsides
* Cochlearia officinalis oblongifolia (DC.) Hult.	Pebbly bay beach
* *Rorippa palustris* (L.) Besser	Cleared ground
* *Sinapis arvensis* L.	Sandy ocean beach

DROSERACEAE

*† Drosera rotundifolia L.	Edge of pond

SAXIFRAGACEAE

* Chrysosplenium tetrandrum (Lund) Th. Fries	Creek banks
*† Parnassia palustris L.	Muskeg
* Ribes bracteosum Dougl.	Creek banks (Coville & Kearney)
“ laxiflorum Pursh	Roadside banks
Tiarella trifoliata L.	Cleared ground

ROSACEAE

* Aruncus sylvester Kostel.	Roadside banks
Fragaria chiloensis (L.) Duchesne	“ “
Geum calthifolium Menz.	Muskeg
† “ macrophyllum Willd.	Roadside banks
Potentilla pacifica Howell [P. anserina L.]	“ “
† “ palustris (L.) Scop.	Roadside ditches
*†W Rubus nutkanus Mociño[17]	Roadside banks
“ pedatus Smith	Edge of woods
“ spectabilis Pursh	All thickets
“ stellatus Smith	Edge of woods
† Sanguisorba stipulata Raf. [S. latifolia Coville]	Muskeg

FABACEAE

† Lathyrus maritimus (L.) Bigel.	Muskeg
† “ palustris L.	Sandy ocean beach
Lupinus nootkatensis Donn [L. n. unalaskensis S. Wats.]	Railroad right of way
* “ ————[18]	Muskeg
* *Trifolium repens* L.	Railroad right of way

EMPETRACEAE

*† Empetrum nigrum L.	Muskeg[19]

VIOLACEAE

* Viola adunca Smith	Edge of thicket on sandy ocean beach
* “ epipsela Ledeb.	Muskeg
“ glabella Nutt.	Edge of woods
“ langsdorffii Fisch.	Muskeg

---

[16] Listed as *T. sparsiflorum* Gray by Hultén, but distinguished by Boivin in Rhodora 46: 369, 1944.

[17] Hulten does not explain why he adopts this name, dating only from 1828, instead of *R. parviflorus* Nutt. of 1818.

[18] Near *L. polyphyllus* Lindl., but leaflets only 10 and hairs silvery.

[19] In open places condensed and closely branched, but in shelter laxly sprawling or semi-climbing and reaching 25 dm. tall.

ONAGRACEAE

† Circaea alpina L.	Cleared ground
*† Epilobium angustifolium L.	Roadside banks
* “ behringianum Haussk.	Roadside ditches
* “ bongardi Haussk.[20]	“ “
† “ latifolium L.	Muskeg

HALORAGIDACEAE

*† Hippuris vulgaris L.	Immersed in creek
*† Myriophyllum spicatum L.[21]	“ “ “

ARALIACEAE

Echinopanax horridum (Smith) D. & P.	All thickets and woods

APIACEAE

Coelopleurum gmelini (DC.) Ledeb.	Roadside ditches
† Conioselinum gmelini (C. & S.) C. & R. [Selinum gmelini (C. & S.) Kurtz]	Roadside banks
Glehnia leiocarpa Mathias [Phellopterus littoralis Schmidt]	Sandy ocean beach
† Heracleum maximum Bartram [H. lanatum Michx.]	Wet banks
Ligusticum hultenii Fern. [L. scothicum L.]	Top of sandy ocean beach
* Osmorrhiza purpurea (C. & R.) Suksd.	Thickets

CORNACEAE

† Cornus canadensis L.	Edge of woods

PYROLACEAE

† Moneses uniflora (L.) Gray	Virgin forest
*† Pyrola asarifolia incarnata (DC.) Fern.	Willow thicket
† “ minor L.	Edge of woods
† “ secunda L.	“ “ “

ERICACEAE

Cassiope stelleriana (Pall.) DC.	Edge of pond
Menziesia ferruginea Smith	Roadside banks
*† Oxycoccus microcarpus Turcz.	Muskeg
† Vaccinum ovalifolium Smith	Edge of woods
* “ parvifolium Smith	“ “ “
*† “ uliginosum L.	Muskeg

PRIMULACEAE

* Dodecatheon superbum sp. nov.[22]	Muskeg
† Glaux maritima L.	Pebbly bay beach
Trientalis europaea arctica (Fisch.) Ledeb.	Edge of pond

GENTIANACEAE

† Menyanthes trifoliata L.	Edge of pond
* Swertia perennis L.	Muskeg

POLEMONIACEAE

* Polemonium acutiflorum Willd.	Muskeg

---

[20] Here applied to an ally of *E. hornemanni* Reichb., from which it seems to differ by leaves more acute (cuneate) to base and apex, by petals but little (rather than much) longer than sepals, and coma of seed pure white (rather than rusty). This characterization includes also *Anderson* 6320 from Juneau, which would be near Sitka. the assumed source of Bongard's original specimen. Trelease, in Ann. Rep. Missouri Bot. Gard. 2: 107, 1891, described the coma of *E. bongardi* as " very dingy ", but Haussknecht (whose specimens Trelease did not see) said nothing about its color.

[21] Material sterile, so not decisive between this and *exalbescens* Fern.

[22] See ADDENDUM.

BORAGINACEAE	
† Mertensia maritima (L.) S. F. Gray [Pneumaria maritima (L.) Hill]	Pebbly bay shore
SCROPHULARIACEAE	
Castilleja unalaschcensis (C. & S.) Malte [C. miniata Dougl.]	Sandy ocean beaches [23]
Mimulus guttatus Fisch. [M. langsdorffii Donn]	Shores of creek
† Pedicularis parviflora Smith [P. palustris wlassowiana (Steven) Bunge]	Muskeg
Rhinanthus arcticus (Sterneck) Pennell [24] [R. crista-galli L.]	“
*† Veronica americana (Raf.) Schwein.	Wet roadside banks
LENTIBULARIACEAE	
*† Pinguicula vulgaris L.	Muskeg
PLANTAGINACEAE	
*† Plantago juncoides Lam.	Pebbly bay shore
* “ macrocarpa C. & S.	Muskeg
* “ *major* L.[25]	Cleared ground
RUBIACEAE	
*† Galium aparine L.	Roadside banks
* “ trifidum columbianum (Rydb.) Hult.	Edge of pond
CAPRIFOLIACEAE	
† Sambucus racemosa pubens (Michx.) Hult. [S. racemosa L.]	Thickets
† Viburnum pauciflorum Pylaie	Virgin forest

[23] My two collections, identified as this by Dr. Pennell, differed markedly in the field. One was yellowish green, up to 9 dm. tall, coarse, its leaves congested, broad and with obtuse tips, and its greenish yellow flower-clusters very closely compact. The other was purplish, both as to leaves and stems, not so tall (about 4.5 dm. tall) nor so coarse, its leaves not congested, narrow and attenuate to sharp tips, and its flower-heads more yellowish, slightly tinged with pink or red. L. D. S.

[24] New transfer, based on *Alectorolophus arcticus* Sterneck, in Zool.-Bot. Gesellsch. Wien 12: 114, 1901, where the source was given as “Herbar. United States National, Nr. 68! Nordamerika: Alaska: Yakutat Bay, Ocean Cape (Sch)”, the last signifying that the specimen was seen in “Herbarium Schinz (Zürich)”. From all this it appears that the type was actually Frederick Funston's number 68, collected July 18, 1892, this specimen having been distributed by the United States National Herbarium. I had expected that the plant of Yakutat would prove to be *R. borealis* (Sterneck) Chabert, prevalent on the Pacific coast of Alaska, but the corolla is larger (10-12 mm., rather than 8-9 mm. long), with the galea more rounded at apex, the fruiting calyx larger, and the stem-leaves oblong-lanceolate and crenate-dentate (rather than linear-lanceolate to lanceolate, and sharply dentate). Hultén, in his “Flora of the Aleutian Islands” (p. 295), merges both these species under *R. groenlandicus* Chab., which name he prefers to *R. pacificus*, both of 1899, because Ostenfeld had united thereunder these two last-named species. It is, however, clear that of these *pacificus* is the older, since, when Chabert published *R. groenlandicus* on page 515 of the Bulletin de l'Herbier Boissier (vol. 7) under date of July 25, 1899, he had already on page 429 under date of June 20, 1899 formed the combination *R. borealis* based upon the yet earlier *Alectorolophus borealis* Sterneck. The matter is presumably academic, since the Greenland plant, with its corolla up to 15 mm. long, is likely neither of these Pacific species.

[25] A small slightly pubescent form, that is presumably what is meant by J. K. Henry in his “Flora of Southern British Columbia and Vancouver Island” (p. 276, 1915) as var. *minima* (Lam. & DC.) Dcne., with the comment, “A small, hairy form near the sea”. *P. minima* Lam. & DC., of France, was originally characterized as a finely hairy miniature of *P. major*, being only 3 cm. tall, and with few-flowered spikes. Two of Stair's three specimens are that small, but the third is larger, with larger leaves and a many-flowered spike that reaches 15 cm. long. We suspect that *minima* is merely a vegetative extreme, and we follow Hultén in considering *P. major* as naturalized on the Pacific coast of Alaska.

ASTERACEAE

† Achillea borealis Bong. [A. millefolium L.]	Muskeg
† Anaphalis margaritacea occidentalis Greene [Antennaria margaritacea (L.) Hook.]	Roadside banks
Arnica latifolia Bong.[26]	Railroad right of way
† Aster foliaceus Lindl.	Muskeg
Aster peregrinus Pursh [Erigeron salsuginosus (Richards.) Gray] [27]	"
* *Matricaria suaveolens* (Pursh) Buchen.	Railroad right of way
Petasites hyperboreus Rydb. [Tussilago frigida L.]	Cleared ground
Prenanthes lessingii Hult. [P. alata (Hook.) Gray]	Roadside banks
*† Senecio pseudoarnica Less.	Sandy ocean beaches
* " triangularis Hook.	Muskeg
*† Taraxacum latilobum DC.[28]	Railroad right of way

ADDENDUM

Dodecatheon superbum Pennell & Stair, species nova Plate 6.

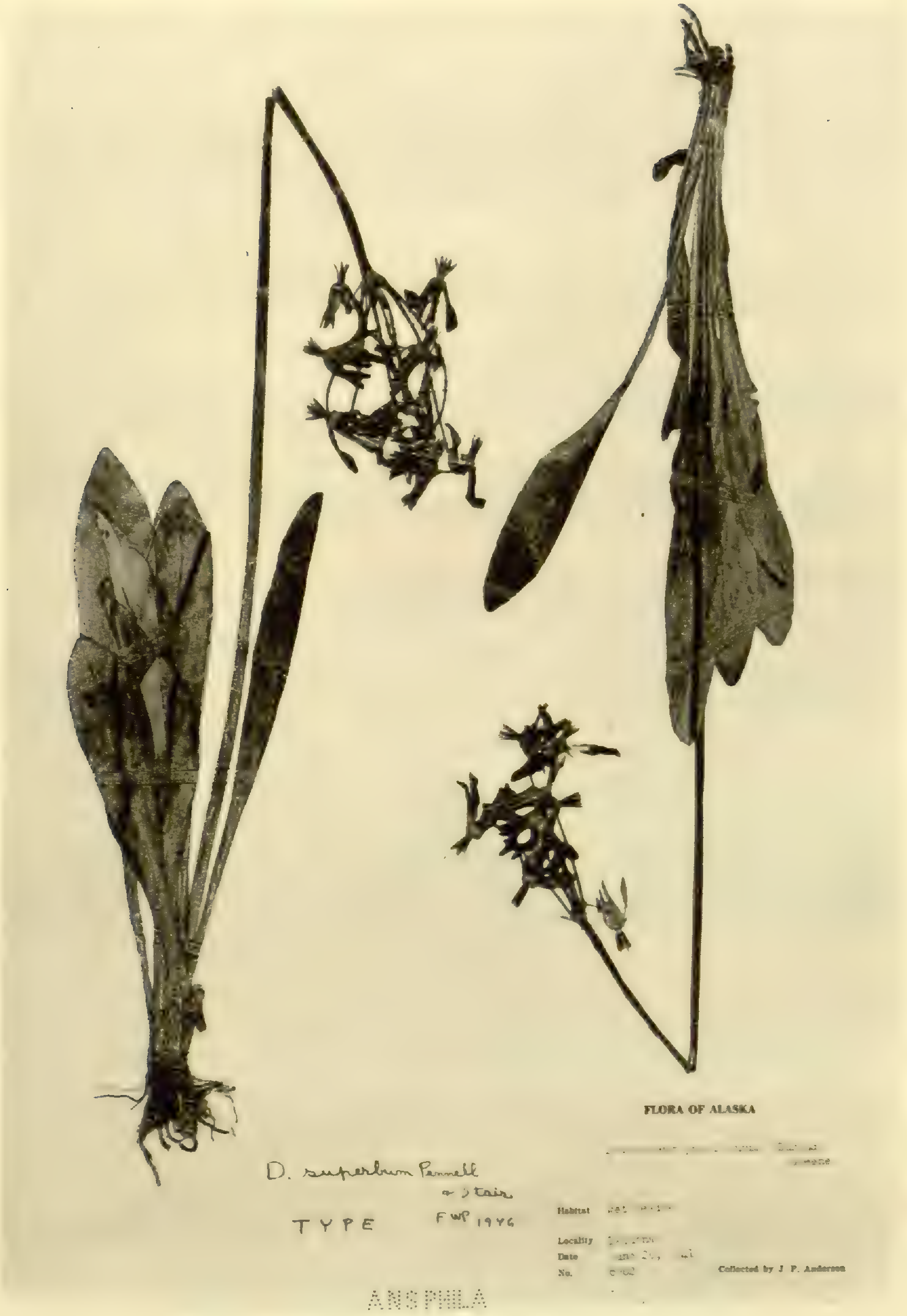
Roots from a thick descending rhizome that is usually very short but sometimes 3-4 cm. long. Plant glabrous and slightly glaucous throughout, or the inflorescence sometimes slightly glandular-puberulent. Leaves light green, slightly paler beneath, the blades spatulate-oblong, obtuse or rounded at apex, entire or obscurely sinuate-crenate, cuneately narrowed to margined petioles that may be nearly as long as the blades, the whole leaves usually 10-20 cm. long, 1.5-4 cm. wide, and about half the length of the scape. Scape stout, becoming 2-4 dm. tall, bearing a whorl of lanceolate to oblong acute green bracts 5-15 mm. long, which are much exceeded by the 6 to 13 dark pedicels, the longest of which may attain 30-60 mm. long. Calyx-lobes lanceolate, green throughout, 4-6 mm. long. Corolla pale at base, the reflexed lobes 10-17 mm. long, violet-purple (" pink to lavender-pink ", as noted living by Stair). Filaments united into a yellow cylinder 1.5-2.5 mm. long, the violet anthers 5-6 mm. long (2½ to 3½ times the length of the filaments). Style slender, violet, exceeding the anthers (usually by 2-3 mm.). Capsule cylindric, 13-17 mm. long.

---

[26] Leaf-blades crenate-dentate, about as described by Maguire (in Brittonia 4: 436, 1943) for the type which was presumably gathered near Sitka. The plant of inland western Canada and the United States shows more sharply dentate leaf-blades.

[27] Concerning this and the preceding, both collected on July 13, Mr. Stair comments as follows. "*Aster peregrinus* was very common on the muskeg, covering large areas. It was first thought an *Erigeron* because of the many long narrow pink or white rays and hairy involucral bracts, its heads being 2 cm. in diameter and over 4 cm. across the rays. In contrast *A. foliaceus* grew singly or scattered, and its fewer and wider rays were deep bluish purple, its involucral bracts merely ciliolate, while its heads were single and as large as 2.5 cm. in diameter or 5 cm. across the rays. The flowering of *A. foliaceus* was starting, when that of *A. peregrinus* was beginning to wane." This last item seems to explain both the unusually large size of the heads for *A. foliaceus* and their being solitary, the secondary heads of this species developing later.

[28] Well matching Fernald & Long's (et al.) collections so identified from western Newfoundland (27176, in 1924, from St. Barbe; and 2159, in 1929, from Old Port au Choix in the region of St. John Bay) as to stature, pubescence, achenes, and leaves, except that the last are paler green (perhaps even glaucous beneath) and their segments are more saliently dentate. This is presumably the cut-leaved extreme of Greene's characterization of his *T. chamissonis* from the Pacific coast of Alaska, and we suggest that it may appear an undescribed species to specialists on *Taraxacum*. Its occurrence at Yukutat would also accord with its being a recent immigrant there.


FLORA OF ALASKA
D. superbum Pennell
& Stair
TYPE
FWP 1946
Habitat
Locality
Date
No.
Collected by J. P. Anderson
ANSPHILA

Dodecatheon superbum, from Eklutna, Alaska. Type specimen photographed by A. Delwin Warden.

Planta omnino glabra aut in inflorescentia parum glandulari-puberula; folia spathulato-oblonga, obtusa aut rotundata, integra aut obscure sinuato-crenata, proxime ad petiolos marginatos largos cuneata, foliis plerumque 10-20 cm. longis; scapus 2-4 dm. longus; pedicelli 6-13, usque 30-60 cm. longi; lobi calycis lanceolati, 4-6 mm. longi; corolla ad basim pallida, lobis violaceo-purpureis, 10-17 mm. longis; filamenta flava connata 1.5-2.5 mm. longa, antheris violaceis, 5-6 mm. longis; stylus violaceus, antheris plerumque 2-3 mm. longior; capsula cylindrica, 13-17 mm. longa.

Type, wet meadow, Eklutna,[29] Alaska, collected in flower June 26, 1941, by J. P. Anderson, no. 6962; in herbarium of the Academy of Natural Sciences of Philadelphia.

Grassy meadows and muskeg, along the Pacific coast from Kodiak Island, Alaska, to Puget Sound, Washington. Represented in the Academy's herbarium by the following specimens:

ALASKA. Kodiak, *A. Kellogg* 205; Seward, *Anderson* 6745; Yakutat, *Stair;* Eklutna, *Anderson* 6962; Juneau,[30] *Anderson* 6355; Sitka, *Chlebnikoff, Peters, & Wrangell.*

WASHINGTON. Lummi Rocks, Whatcom Co., *W. C. Muenscher* 9720; Whidby Island, *J. W. Thompson* 6096.

This plant has been passing as *Dodecatheon pauciflorum* (Durand) Greene, which was based upon *D. meadia pauciflorum* Durand (in Journ. Acad. Nat. Sci. Phila. II, 3: 95, 1855) from "Ad orientem et occidentem fluminis Missouri usque ad Montes Scopulosos". The plant first described is evidently that prevalent in the mountains around and in the upper Missouri valley, extending from Alberta and North Dakota to Utah, eastern Washington, and eastern Oregon; this plant bears smaller flowers than *D. superbum,* and these have the yellow filament-tube ½ to ⅔ the length of the anthers (which are only 4-5 mm. long). Also, the leaves are much less than half the length of the stem. These characters are well depicted on the plate in the Botanical Magazine (pl. 3622 in 1837), although the flowers are only occasionally so many. Usually, the scapes bear less than six flowers, and so deserve Durand's epithet.

It is most natural that the species of the humid northwestern coast should be different from that of the arid interior of the continent. The former is a stouter and more impressive plant, and one of the finest of its beautiful genus.

---

[29] Eklutna, a place not in Marcus Baker's "Geographic Dictionary of Alaska" (Bull. U. S. Geol. Surv. 187, 1902) is located "near the head of Knik Arm of Cook Inlet about 18 miles south of Matanuska", according to information from J. P. Anderson.

[30] Another collection from Juneau, Anderson 6354, gathered in flower and fruit May 18, 1940 on an alpine meadow, is a lower plant with darker green narrowly elliptic leaf-blades, scapes not over 2 dm. tall with only 2 to 4 flowers, and corolla with yellow filament-tube about ½ the length of the anthers. In these points it approaches *D. pauciflorum* but the alpine environment and its remoteness from the range of that plant suggests that yet another species is involved. By the collector it was identified as *D. frigidum* C. & S., but that Arctic species has its inflorescence strongly glandular-puberulent and its anthers nearly sessile, the filament-ring being scarcely developed.

Notes on Pennsylvania and New Jersey Grasses[1]

RICHARD W. POHL

The following records represent extensions of the ranges given by Hitchcock (Manual of the Grasses of the U. S. 1935) or others. Names of the herbaria in which the cited specimens are deposited are abbreviated as follows: A.: Herbarium of the Philadelphia Botanical Club at the Academy of Natural Sciences; P.: Herbarium of the University of Pennsylvania; U. S.: United States National Herbarium. A number of these records are of ballast waifs, which may not have persisted until the present time. Absence of recent collections indicates their probable disappearance from this area.

PSEUDOSASA JAPONICA (Sieb. & Zucc.) Makino (*Arundinaria japonica* S. & Z.)

A thriving colony of this species exists on the embankment of the Pennsylvania Railroad at the west end of the South Street Bridge in Philadelphia. It has persisted there at least thirteen years, being collected there in 1932 by Witte and in 1945 by me. Several smaller colonies are scattered along the tracks for about a quarter of a mile from the above colony. The plant has not been known to bloom here.

PENNSYLVANIA: Philadelphia Co.: Pennsylvania R. R. embankment at 32nd and South Sts., Philadelphia, October 18, 1932, *W. W. Witte* (A., P.); Railroad embankment at west end of South St. Bridge, Philadelphia, October 17, 1945, *R. W. Pohl* 5221 (U. S.).

VULPIA ELLIOTEA (Raf.) Fernald (*Festuca sciurea* Nutt.)

The first report of this species from New Jersey was by Dr. F. J. Hermann (in Rhodora 37:266-7. 1935), from Gloucester County. Hermann wrote that his plants were all dwarfs, whereas the present specimen is well developed and nearly 5 dm. tall.

NEW JERSEY: Cape May Co.: Open sand behind dunes n. of Stone Harbor, June 2, 1935, *F. S. Fender* 559 (P.).

GLYCERIA BOREALIS (Nash) Batchelder

To the first definite report of this species from Pennsylvania, made by Dr. H. A. Wahl (in Rhodora 47:42. 1945), may be added the following.

PENNSYLVANIA: Wayne Co.: In water along lake shore, Lake Shehawken, July 9, 1945, *W. L. Dix* 646 (P.) Susquehanna Co.: Marshy shore of Mud Pond, about 3 mi. e. of Ararat, July 12, 1936, *S. L. Glowenke* (P.) Pike Co.: Peck's Pond, July, 1925, T. R. Brendle (P.).

TRIODIA CHAPMANI (Small) Bush

Professor Fernald reported (Rhodora 42:410. 1940) that this species apparently reached its northern limit in southeastern Virginia. The present record gives an extension of about 200 miles to the northeast.

---

[1] This work was done while the author held a predoctoral fellowship under the National Research Council.

NEW JERSEY: Cape May Co.: Anglesea. September, 1907. J. M. Macfarlane (P.).

AEGILOPS TRIUNCIALIS L.

A European species, listed by Hitchcock only from California. It was accompanied at this station by *Hordeum murinum* and may have been introduced with it from the West.

PENNSYLVANIA: Chester Co.: West Chester, near Kift's Greenhouses, June 12, 1925, *Wm. Trimble* (A.).

HAYNALDIA VILLOSA (L.) Schur

Waif, introduced from the Mediterranean Region. No recent collections. Not reported from the United States by Hitchcock.

PENNSYLVANIA: Philadelphia Co.: Centennial Grounds, Philadelphia, June 16, 1877, Isaac Burk (P.).

HORDEUM PUSILLUM Nutt.

Adventive from the West; not reported from Pennsylvania by Hitchcock.

PENNSYLVANIA: Bucks Co.: Perkasie, June 16, 1896, *F. L. Bassett* (A.). Bedford Co.: 0.9 mi. w. of Juniata Crossing, May 28, 1942, *D. Berkheimer* 3052 (P.).

HORDEUM MURINUM L.

Not reported from Pennsylvania by Hitchcock. This occurrence is curiously coincidental with that of *Aegilops triuncialis.* These two strays may have been introduced from the West in seed, packing, or manure.

PENNSYLVANIA: Chester Co.: Near Kift's Greenhouses, West Chester, June 13, 1925, *Wm. Trimble* (A.).

HORDEUM GUSSONEANUM Parl.

Ballast waif at Philadelphia; not reported from Pennsylvania by Hitchcock. No recent collections.

PENNSYLVANIA: Philadelphia Co.: Girard Point, Philadelphia, on ballast, Herb. Isaac Burk (P.).

PHOLIURUS INCURVUS (L.) Schinz and Thell.

Ballast waif, Philadelphia; not reported from Pennsylvania by Hitchcock. No recent collections.

PENNSYLVANIA: Philadelphia Co.: Ballast, Philadelphia. August, 1878, Herb. *Isaac C. Martindale* (A.); Old Navy Yard, Philadelphia. Herb. *Isaac Burk* (P.).

CORYNEPHORUS CANESCENS (L.) Beauv.

This species has been found a number of times on ballast around eastern cities, and has also apparently become established on Long Island. The following specimen affords the first modern record from New Jersey. The plant resembles a small *Festuca* but may be quickly recognized by the very unusual awns of the lemmas. These awns have a straight, brown, spirally-marked lower segment, surmounted by a minute crown. The upper segment is white and club-shaped.

NEW JERSEY: Ocean Co.: Sandy fill, roadside ¼ mi. e. of Lakehurst, July 20, 1935, *J. M. Fogg, Jr.* 9132 (A., P.).

ARRHENATHERUM ELATIUS (L.) Mert. & Koch, var. BIARISTATUM Peterm.

This unusual form of the common tall oatgrass resembles species of *Avena* in having the two florets externally similar. Both florets bear well developed awns, inserted near the bases of the lemmas. It may be distinguished from species of *Avena* by its staminate lower floret. The present record is apparently the first for the United States.

PENNSYLVANIA: Delaware Co.: Grassy roadside, ¼ mi. s.w. of railroad station, Moylan, June 9, 1946, *Elizabeth C. Earle* 4270 (P.).

HOLCUS MOLLIS L.

Waif at Philadelphia. No recent collections.

PENNSYLVANIA: Philadelphia Co.: Greenwich Point, Philadelphia, *Charles E. Smith* (A.).

AMMOPHILA BREVILIGULATA Fernald

Sand beaches of Presque Isle. Not reported from Pennsylvania by Hitchcock.

PENNSYLVANIA: Erie Co.: Presque Isle, July 20, 1926, *O. E. Jennings* (P.).

ALOPECURUS RENDLEI Eig (*A. utriculatus* (L.) Pers.)

Ballast waif; not reported from the United States by Hitchcock. No recent collections.

PENNSYLVANIA: Philadelphia Co.: On ballast, Old Navy Yard, Philadelphia, May 28, 1880, *Isaac Burk* (A., P., U. S.).

HIEROCHLOE ODORATA (L.) Beauv.

While not reported by Hitchcock, this species has been collected several times in Pennsylvania.

PENNSYLVANIA: Wayne Co.: Common in seepy meadow near southern base of Sugarloaf Mt., 1 mi. w. of Orson, May 18, 1937, *S. L. Glowenke* 146 (P.). Allegheny Co.: Neville Island, Ohio River, May 3, 1899, *J. A. Shafer* (P.).

The eastern American representatives of this species have been called var. *fragrans* (Willd.) Richter, by Professor Fernald (in Rhodora 19:152. 1917). Willdenow's description of his *Holcus fragrans* calls for a plant having the sterile lemmas not ciliate and the apex of the fertile floret smooth. Our specimens do not show these characteristics.

ZIZANIA AQUATICA L., var. ANGUSTIFOLIA Hitch.

This is the plant referred to as *Z. aquatica* by Gress (Grasses of Pennsylvania. 1924). Var. *angustifolia* was not reported from Pennsylvania by Fassett, who studied the genus (in Rhodora 26: 153-60. 1924), or by Hitchcock. It is known in the State only from Presque Isle, the wild rice of the Philadelphia area being typical *Z. aquatica.*

PENNSYLVANIA: Erie Co.: Presque Isle, August 12, 1911, *O. E. & G. K. Jennings* (P.); Presque Isle, August 17, 1919, *E. M. Gress & S. H. Williams* (P.).

PASPALUM PUBIFLORUM Rupr., var. GLABRUM Vasey

Waif.

PENNSYLVANIA: Delaware Co.: Grounds of American Dyewood Co., Chester, September 20, 1935, *Eva Frank* (P., U. S.). Identified by Agnes Chase.

PANICUM ACROANTHUM Steud.

Waif, apparently represented from the United States only by the following specimens. Introduced from Asia. No recent collections.

PENNSYLVANIA: Philadelphia Co.: Japanese Garden, Fairmount Park, Philadelphia, October 28, 1877 (P.); Old Navy Yard, Philadelphia (P.). No collector given.

SETARIA FABERII Herrm.

Known previously from the Piedmont and Coastal Plain in southeastern Pennsylvania, *S. faberii* now turns up in the mountains. I found it growing in profusion along the new Pennsylvania Turnpike for about a mile. Here the plant was rooted in damp, chippy, sterile shale of the road-cut and apparently thriving on such meager nutrition. Dr. David Berkheimer has also collected it in Bedford County, slightly farther west.[2]

PENNSYLVANIA: Fulton Co.: Along Pennsylvania Turnpike, 1 mi. w. of Hustontown (near milepost 53, west), July 15, 1946, *R. W. Pohl* 5891 (P., U. S.). Bedford Co.: Railroad siding ⅜ mi. w.n.w. of Everett, August 13, 1944, *D. Berkheimer* 5390 (P.); 2½ mi. n.e. of Breezewood, August 10, 1944, *D. Berkheimer* 5311 (P.).

BOTANICAL LABORATORY
UNIVERSITY OF PENNSYLVANIA

---

[2] Numerous new occurrences of this species have been discovered in the local area during the past season. In addition to those that I am not citing, the plant has been found in the higher portions of the Piedmont, in the Ridge and Valley Province, and on the Appalachian Plateau Front, though not as yet west of it. Mostly it occurs on the rich, disturbed soil of cornfields and gardens. These extra-local counties, with the collection-numbers of my own specimens therefrom, are as follows: Adams (6265, 6270), Bedford, Cumberland (6232, 6552), Fulton (5891), Juniata (6325, 6551), Lebanon (6553), Lycoming (6049), Perry (6323), and York (*E. T. Moul* 2428).

New Plant Names Published by Amos Eaton Between the Years 1817 and 1840[1]

Elmer D. Merrill and John R. Reeder

Amos Eaton produced the first popular descriptive botanical manual for North America in 1817, although this was admittedly very incomplete, being almost wholly a compilation from the works of other authors. He included brief descriptions of the genera, followed by even shorter descriptions of the species that he arbitrarily selected. The list of species was admittedly limited to the more common and better known ones, and largely those that occurred in New England and the Central Atlantic States, although he did include certain southern species, chiefly those of economic importance, such as the sugar cane, *Saccharum officinarum* Linn., a few species of *Citrus*, etc. Prior to this time no texts were available for students. The relatively few individuals in the United States who were interested in plants and in plant names, chiefly practising physicians, had to depend on such more technical works as Walter's " Flora Caroliniana " (1788), Michaux's " Flora Boreali-Americana " (1803), Pursh's " Flora Americae Septentrionalis " (1814), and Nuttall's contemporary " Genera of North American Plants " (1818), supplemented by certain standard European treatises covering what was then known of the flora of the entire world, such as the several editions of Linnaeus' " Species Plantarum " and Persoon's " Synopsis Plantarum."

It is true that Bigelow's pioneer descriptive " Florula Bostoniensis " had been published in 1814, and Barton's list in his " Florae Philadelphicae Prodromus " had appeared in the same year, to be followed in 1818 and 1824 by his descriptive " Compendium Florae Philadelphicae," and Elliott had commenced the publication of his " Sketch of the Botany of South Carolina and Georgia " in 1816, which was completed in 1824. But these were local floras, and the last, the most pretentious of all of them, was out of range as far as the first edition of Eaton's " Manual " was concerned. Also Muhlenberg's " Catalogus Plantarum Americae Septentrionalis " had been issued in 1813, to be followed by its second edition in 1818, but this was a list, without descriptions, and hence of little value to other than the very few more or less professional American botanists of the time.

It is clear that Eaton[2] was a dynamic individual and an inspiring teacher. He never claimed to be a botanist, and yet he produced a work that, for its time, evidently served a useful purpose. Clearly he had in mind the needs of students and of the man on the street, for all editions were made as simple and non-

---

[1] Acknowledgment is made to the American Philosophical Society for a grant from the Penrose Fund that rendered the preparation of this paper possible.

[2] See *McAllister, E. M.* Amos Eaton, Scientist and Educator, 1776-1842. i-xiii, 1-587, illus. 1941.

technical as possible in order to cater to these needs, and to encourage a wider popular interest in botany. In order to keep the size of his various editions within reasonable bounds, and the selling price as low as possible, he not only kept his descriptions very short, but devised a large number of cryptic abbreviations, some of which are by no means clear, unless one takes the trouble to look up his explanations; for somewhere in all of the editions the abbreviations are explained. Not even the authorities for the accepted names were given in editions one and two. The very simplicity of all eight editions of his work is doubtless one of the reasons why Eaton's " Manual " has escaped the critical attention of many botanists. The almost utter lack of documentation in Eaton's " Manual," as to the new names contained therein, is striking; as is also the extraordinarily high percentage of error in citing authorities for the accepted binomials.

Although making no pretentions to being a professional botanist, Eaton commenced, even in the first edition, to publish new names and to prepare descriptions of a limited number of new species, and later even of a few new genera. Also, perhaps without full appreciation of the fact, he published a very considerable number of new names when, of necessity, he transferred species from the genus in which they were originally described to other generic names. Because of the obscurity of publication, most of the new Eaton names of this type have been entirely overlooked by compilers of standard indices and by modern botanists as well. The latter, of course, depend very largely for the names they have to consider on those included in such publications as " Index Kewensis ", and Christensen's " Index Filicum ".

Any botanist who will take the trouble to scan any edition of Eaton's " Manual " will at once realize the difficulties involved in detecting new names. It is true that the few new generic names published by him and the relatively few new species that he proposed and described are mostly indicated in the text as new; usually these have been included in standard indices and have been accounted for by Eaton's successors. His general practice, in transferring a species name from one genus to another, was to credit the authority for the new name to the original author, a practice that shows why most such names have been hitherto overlooked. There is no evidence that Eaton even realized that in such cases he was publishing new names. He was, in general, rather violently opposed to such changes, even as he was equally opposed to innovations, although from edition two (1818) to edition eight (1840), he did accept the majority of the new species published by reputable botanists such as Nuttall, Torrey, Hooker, and others. Like others of his time he practically ignored the erratic work of Rafinesque.

His objections to changes in names, no matter for what reason, are expressed in his observations on *Monotropa* versus *Pterospora*, Manual, ed. 3, 414. 1822: " The present rage for cutting up genera has gained such an ascendancy, that I am compelled to yield to it, though with pain and regret. Every *artificial* character is seized with greadiness (*sic!*) and applied with great ingenuity in mangling the Linnean system of genera. I consider it the ephemeral reign of innovators, which our successors will remember but to despise. And most of these new names which are founded on artificial characters will soon sleep with their authors."

A few of Eaton's own new species, as well as some proposed by Torrey, Aikin, Drayton, Hall, Beck and Tracy, and others that Eaton published, have been overlooked, and should be incorporated in some future supplement to " Index Kewensis." In checking the Eaton names it is noted that the entries for those that are listed are not always correct, for many of them were actually published in editions of his " Manual " earlier than the " Index Kewensis " entries indicate. The total number of unlisted names that we have located in the course of examining Eaton's publications and those of his contemporaries and successors is surprisingly large, from all sources unlisted names approximating 250, with about 60 corrections to entries that have previously been made. In this consideration of Eaton's new names, as well as a considerable number proposed by others, additions to standard indices are indicated by an asterisk (*), and corrections by the sign (†).

It is perhaps to be regretted that those modern botanists who, in the course of their investigations, have from time to time detected unlisted names, and in some cases mentioned the fact that they are unlisted, have not, in general, reported these to the editors of " Index Kewensis." Had this been done it is probable that many of them would have been checked and included in this or that supplement to that indispensable work. In the course of our investigations we note that occasional modern authors have discussed such unlisted names as *Salix obovata* Pursh (1814), *Peltandra glauca* Feay (1861), *Polygonum natans* Eaton (1822), *Rumex hastatulus* (Baldw. (1817), *Torreya* Eaton (1829), *Arabis hastata* Torr. (1818), and others. These names, not having been reported as unlisted, are still not included in the supplements to " Index Kewensis " although in some cases, such as *Rumex hastatulus,* the binomials involved are accepted in all standard works as the proper names for recognized species. The only case that we have noted where one of our authors did report unlisted new names is to the credit of the late K. K. Mackenzie, who apparently reported the new Eaton names in *Carex* (1929), for they are included in supplement eight to " Index Kewensis " (1933). Particularly exasperating is such a case as *Peltandra glauca* (Ell.) Feay, accepted as the proper name for a valid species by the late John K. Small, Man. Southeast. Fl. 246. 1933, for an examination of Feay's few published papers failed to reveal its place of publication. This was supplied by Mr. E. J. Alexander, who informed us that Alphonso Wood published this Feay binomial in his " Class-Book " in 1861. Here, curiously, its name-bringing synonym *Caladium glaucum* Ell. (1824) proved to be unlisted. And yet Dr. Small took the trouble on pages 1503 to 1509 of his work to list the 259 new names proposed by him in the text, as if such a list were important to others than himself and to about two bibliographers in the world who are charged with recording new names; yet he did not mention either the overlooked Elliott name or the obscurely published and unlisted Feay name that he accepted!

Our purpose in preparing this consideration of Eaton's new plant names has been to list all of those for which he was responsible, even including those that are correctly entered in Index Kewensis. We realize that in listing these names we are merely adding to the burden of synonymy, yet this type of botanical bibliography is justified in reference to the complete history of all published binomials whether the names be valid or invalid. It is rather curious to note that these Eaton names published from a hundred and six to a hundred twenty-nine years ago scarcely affect names that are generally accepted and widely used today. In at least two cases the application of the homonym rule will require changes in the names of one Eastern Asiatic and one Santo Domingo species. In a very few cases the name of Eaton replaces that of some other author as the authority, because he actually effected the transfers earlier than the authors to whom the names are currently accredited. The surprising thing, considering the obscurity of publication that is characteristic of Eaton's work, is that so many of his names (about fifty) have been already detected and listed.

The attention of the senior author was directed to Eaton's " Manual " through his checking of the very numerous Rafinesque names, a high percentage of which have been entirely overlooked by the compilers of standard indices, and hence by botanists in general. A certain amount of random sampling revealed so many of these unlisted names in Eaton's work that, over a period of two years, all entries in all editions of Eaton's " Manual " were compiled, and this list had been checked on standard indices before the preparation of this paper was initiated. This list, therefore, is the basis of the present paper. It was a time-consuming task to prepare the preliminary data, for Eaton used about 1,300 different generic names and more than 8,000 binomials in the eight editions of his work. Many of these names appear in all editions, but, some in a few or only in one edition. We have given no attention to the numerous varieties (about 430) that he recognized, many of which he doubtless accepted from the works of earlier authors, although it is certain that he was the original proposer of a considerable number of these.

While we hope that we have detected and listed most of the new Eaton names, we are not sufficiently optimistic to believe that we may have located all of them. Our interest has been confined to the new names for the vascular cryptogams and the flowering plants. We have not listed those for the cellular cryptogams, but content ourselves with calling attention to the fact that there are a few of these although we believe that none is tenable. Examples are the new generic name *Morellus* Eaton, Man. ed. 2, 324. 1818, to replace *Phallus* Linn., the change being made for purely prudish reasons, with *Morellus impudicus* Eaton and *M. esculentus* Eaton, Man. ed. 2, 112. 1818; *Hypnum cooleyanum* H. H. Eaton ex Eaton, Man. ed. 5, Addenda 3. 1829; and *Hydnum chrysorhizum* Torr. ex Eaton, Man. ed. 2, 275. 1818, which was included in editions three to five and then dropped.

The full title of the first edition of Eaton's work is "A Manual of Botany for the Northern States, Comprising Generic Descriptions of all Phenogamous and Cryptogamous Plants to the North of Virginia, Hitherto Described; with References to the Natural Orders of Linneus and Jussieu. Each Genus is Further Illustrated by Short Descriptions of its Most Common Species." The authorship is indicated as: "By the members of the botanical class in Williams College (Mass.) from a manuscript system compiled by the author of Richard's botanical dictionary." Albany. Printed by Webster and Skinners. 1817, pp. i-vi. 1-161. The author of the English edition of Richard's work was Amos Eaton.

This was immediately reviewed by Rafinesque[3] but in spite of its inadequacy and its manifest imperfections, as compared with the works of other authors, such as Pursh, whom Rafinesque very severely criticized, the review was remarkably lenient. Rafinesque could not refrain from expressing his opinion regarding the merits of the natural system of classification as opposed to the artificial Linnaean system, stating: "The genera and species of this manual are *of course* enumerated according to the sexual system of Linnaeus. . . . This unnatural, incorrect, difficult, puzzling, indelicate and obsolete system, prevails as yet in the U. S. . . . [and] will probably be taught and followed for a short period to come . . . when it will *of course* be superseded by the natural method." Rafinesque could not visualize any botanist persisting in following the Linnaean system, little realizing that Eaton, last of the Linnaeists, would extend his work through eight editions up to 1840, without deviating from the artificial system except in reference to the cellular cryptogams.

The caustic Rafinesque apparently realized that Eaton's primary interest was in the popularization of botany, a field which Rafinesque himself attempted to develop from time to time but without too much success. He states that the work "had no higher claim than to the title of a mere compilation [which Eaton himself admitted]; but compilations are sometimes very useful when properly and skillfully executed"; that it was "a practical and useful one (but by no means classical) . . . making allowance for the unavoidable errors in works of this kind, when undertaken in haste by young botanists [Eaton was then 42 years old], not perfectly acquainted with the state of the science"; and further, that such authors "should acquaint themselves thoroughly with the laws, language, and situation of the science both at home and abroad, before they venture to publish their lucubrations and observations." He calls attention to the fact that no authorities are cited for the technical names used and mentions various other defects. Regarding the lack of abbreviations giving credit to original authors, Refinesque remarks: "Let us hope that they [the students] will not be led to believe that Mr. E. is the author of them!"

In the first, as in all later editions, the genera are arranged under the Linnaean classes, for Eaton was an ardent Linnaeist, being the last of the American supporters of that artificial system of classification. It is true that in the first edition he did recognize Jussieu's natural system of classification to the extent of adding, after each generic description, the numbers corresponding to both the Linnaean system and that of Jussieu, and in the second, third and fourth editions he also included lists of the genera under Jussieu's group names. This is as far as he went in relation to the natural system of classification until edition five (1829) appeared, in which he included an epitome of the latter system; this was repeated in all later editions of the " Manual." His uncompromising attitude is reflected in the remarkable preface to edition six (1833), quoted in part below, which, however, he did not repeat in editions seven and eight, although in edition two, 13. 1818, in his discussion of the natural orders of Jussieu he had realized the limitations of the Linnaean artificial system and the importance of the natural arrangement, stating: " The Linnaean artificial arrangement is the only system hitherto brought into use by which we are enabled to find out a plant with which we are unacquainted. But after we have determined a plant by the aid of that system, we should proceed to examine its affinities or relations to other plants." Beginning with the third edition (1822) he added numbers to the genera in the alphabetic sequence by which the student could place his material in both systems explaining on page 152: " The first number on the left of the generic name is the number of the artificial class to which it belongs—the second, of the artificial order. The first on the right, of the natural order of Lineus [*sic!*]—the second, of Jussieu."

---

[3] Am. Monthly Mag. Crit. Rev. 1: 426-430. Oct. 1817.

In edition two (1818), page six of the preface he states: " Nothing can be more interesting, than the study of the natural affinities of plants. But there has been no natural arrangement yet devised by which we can find out the names of plants to which we are strangers. We must therefore follow the Linnaean system, as the only safe guide to direct our steps among strangers in the vegetable kingdom." From this there is the following footnote:

" Mr. Rafinesque, and several other learned botanists, consider a natural classification, *alone,* adequate to the purpose of investigating plants. In a letter which I received from that gentleman, he says: ' I hope to be able, at some future period, to convince you, and many more, that you have not a correct idea of the natural classification.' I am sure, no botanist will hesitate to receive Mr. R's natural classification, when he shall have so far perfected it, that our pupils can dispense with the artificial arrangement. But I fear, this great desideratum is very distant."

Eaton remained unconvinced to the end in spite of the fact that all other botanists had, by the time the last edition of his Manual appeared, long since abandoned the artificial Linnaean classification for the natural one. His attitude is reflected by the following statement quoted from the preface to edition seven of his " Manual," iv. 1836: " The two systems are not in opposition to each other, and cannot be contrasted with any more propriety, than a part can, in any case, be compared with the whole; as one is but an auxiliary to the other. The Natural Method is the *grand climacteric in Botanical science*, and the Artificial System is the *brightest epoch of its youthful pupilage.*" Eaton the amateur apparently preferred to remain among those devotees of the bright epoch of youthful pupilage. On page thirteen of edition six of his " Manual " (1833) he weakened somewhat, for there he states: " Plants are classified upon two distinct plans; the Artificial and Natural. The object of the Artificial system is merely to furnish a method for ascertaining the name of a plant. The object of the Natural system is to bring together into small groups, plants which resemble each other in their botanical affinities, sensible qualities and medicinal properties. The Artificial system has been very aptly compared to the dictionary, and the Natural, to the grammar of a language." Clearly his chief concern was the names of plants, not their relationships.

Little can be said in favor of the first edition of the " Manual " except that it was a pioneer work. One is, however, pleasantly surprised by noting here and there in editions two to four occasional reasonably ample descriptions, and, what is of greater value, critical notes of one kind or another; from these data one can occasionally glean important information regarding this or that species. With edition five the elimination of certain informative data became evident, while in editions six to eight the very brief descriptions became standardized and stereotyped, with most of the notes eliminated in order to save space. One is inclined to evaluate editions two to four as the best, although in all editions new names appear here and there.

Edition one

The first edition of Eaton's " Manual " is a strange little book of 164 pages, distinctly amateurish, but for the time apparently useful. In it he included abbreviated descriptions of about 592 genera and even more abbreviated descriptions of nearly 1,400 species, the latter representing an arbitrary selection from among the more common, better known and widely distributed species chiefly from the northeastern United States. How incomplete this was for 1817 may be indicated by the fact that in 1813 Muhlenberg had included 863 genera and 3,118 species in his " Catalogus Plantarum Americae Septentrionalis," although in fairness to Eaton it should be noted that he attempted to cover only a selection of the flora of the northern states, while Muhlenberg attempted to include every species that had been reported from what was then the United States. He included at least one new species, *Xylosteum solonis* Eaton, p. 26, and deliberately or inadventently proposed a few new names for other species. One new generic name, *Vexillaria* Eaton, was proposed to replace *Clitoria* Linn., here again the change being made for purely prudish reasons as was the case with *Morellus* Eaton, already mentioned.

It is remarkable that this little book should have been published at the expense of sixty-three members of Eaton's natural history classes at Williams College, whose names appear in the dedication " to the author of Richard's botanical dictionary " on pages ii and iii.[4] He says in the preface to edition eight of his work, v. 1840, that he prepared the manuscript in 1816, translating from the works of Pursh, Persoon, Michaux, and others, and that: " the first edition was published in very contracted form by seventy-two [sixty-three names appear in the list] students of Williams College, Mass., as no bookseller would risk the publication. A thousand copies were published and ready for use in June; and not a copy was left in market after six months." The figure, one thousand copies, is probably erroneous, as twenty-two years earlier, in the preface to the second edition, 5. 1818, he said: " The first edition of the Manual was published by the students of Williams College for their own private use. As they struck off about five hundred copies, the work became considerably known. Orders were received by Messrs. Websters and Skinners, in the course of the next season for more than could be supplied." What likelihood is there today that the members of any class in any American college would publish at their own expense any manuscript that one of their professors might prepare for their use? We can only assume that this was a tribute to Amos Eaton's dynamic personality and to his skill as an inspiring teacher.

Eaton definitely planned to include only the more common and widely distributed species, for the most part describing from one or two to three or four species under each genus. Under *Carex,* page 102, he says: " Fifty-five species of Carex have been examined and described in the Northern States. It is therefore very difficult to select the most common, in conformity with our plan. We have inserted none but those found most common near Yale College by the author, and near Williams College by Professor Dewey." Thus in such large genera as *Carex* he admitted 17 species, in *Quercus* 11, in *Aster* 14, in *Ranunculus* 8, in *Rubus* 7, in *Solidago* 7, and in *Panicum* 5. How inadequate this first treatment was may be indicated by the statement that in edition eight (1840), the number of species for these six genera was, *Carex* 163 (in the Mackenzie treatment, 1931-35, the number of *Carex* species recognized is 533), *Aster* 89, *Quercus* 36, *Ranunculus* 51, *Rubus* 29, *Solidago* 71, and *Panicum* 46.

EDITION TWO

This was published in 1818, and the manuscript was well advanced when the first edition was published. He says, p. 8, that " a great proportion of this work was translated two years ago, under the immediate inspection of professor Ives, of Yale College." He speaks of the assistance rendered by Dr. James McBride of South Carolina, the courtesies extended to him by Dr. Jacob Bigelow of Boston, and the value of his correspondence with Dr. John Torrey of New York.

---

[4] For the story of the ultimate fate of the private herbarium of one of these students, David L. Coe, whose collection included nearly 500 species, see Barnhart, J. H. A Century-Old American Herbarium. Jour. N. Y. Bot. Gard. **35**: 241-245. 1934.

This volume consists of 524 pages, and it was in this edition that he adopted the strange policy of segregating his species descriptions entirely from the generic ones, and arranging them under a strictly alphabetic sequence of generic names, with numbers added so that it was relatively easy to turn back to the actual descriptions of the genera. At times Eaton speaks of this part of his manual as the catalogue; for it is, in fact, a descriptive catalogue, although the species that he recognized in the various genera were apparently arranged in relation to their characters and relationships, and in later editions, also more or less geographically. In editions two (1818) to five (1829) the alphabetic sequence included all genera of cellular and vascular cryptogams and those of the flowering plants. Thus, regardless of relationships, we find in sequence *Adonis* (Ranunculaceae), *Aecidium* (Uredinales), *Aeschynomene* (Leguminosae), *Aesculus* (Hippocastaneaceae), *Agaricus* (Agaricaceae), etc., to the end of the alphabet. The added numbers associated with the generic names refer to the generic descriptions in another part of the volume. We know of no other descriptive botanical text where exactly this same scheme was followed, Eaton's innovation remaining uncopied.

The number of genera and species was considerably increased, with 790 genera and 2,446 species recognized and described. As in the first edition authorities for technical names are lacking, and synonyms are not given.

It was manifestly Eaton's intention, as he issued the succeeding editions of his "Manual," to keep it abreast of the then rapid increase in knowledge of the North American flora, as exploration of the West and South developed. But as one checks on the admission of this or that genus or species, proposed by this or that author, one sometimes wonders at the basis of selection. No edition was complete. In all of them scores of proposed entities are missing. Apparently Eaton picked and chose, using some system of his own. A statement in edition seven, 459. 1836, perhaps throws some light on this method or lack of method of selection: "My friend and pupil Mr. Riddell, has announced four new species of Prenanthes, which he names, *miamiensis, ovata, parviflora,* and *proteophylla.* As several other botanists have proposed to me new species in this deceptive genus, I defer their publication for the present, to avoid interference, and the increase of doubtful species." Eaton himself actually proposed only a small number of new species, but he was not above supporting his claims for his brain children, as indicated in edition five, 282. 1829, and in all later editions, under *Lonicera hirsuta* Eaton: "I published this species in the Manual in the year 1818, and repeated it in succeeding editions. Afterwards Goldie came to this state, and also travelled in Canada, where he found it, and examined it with my Manual. In 1822 he published it as a new discovery, under the name *pubescens,* in the Edinburgh Phil. Journal. I do not claim the discovery, for since I published it, I learned that Le Conte had examined it. But the truth should be told."

Clearly no edition was based to any considerable degree on an actual examination of herbarium material; all editions remained basically in the category of compilations. The author states, p. 5: " The reader is not to suppose that I have seen all the plants described in this Manual. I have in my collection but about sixteen hundred of them." [5] By the time the last edition appeared in 1840 the coverage had been extended south to Florida and Louisiana, north to the Arctic regions, and west to the Pacific coast.

It is noteworthy that Eaton was never misled by the erratic work of Rafinesque, for he accepted very few of the numerous new generic names proposed by that strange individual and equally few of his proposed new species, and this even when other botanists of distinction, here and there, had recognized the propriety of accepting some of them. In the later editions of Eaton's Manual it is even more noteworthy how many of the Rafinesque entities that he had accepted in earlier editions were eliminated. Yet there is evidence of some correspondence between Rafinesque and Eaton. Actually two of Rafinesque's manuscript descriptions occur in Eaton's herbarium together with the corresponding specimens that Rafinesque sent. It is evident that Rafinesque hoped that Eaton might accept and publish some of his brain children, but in this he was disappointed. Eaton merely filed the descriptions and the specimens and ignored the proposed " new " species, neither of which happened to be new in any sense of the word.

EDITION THREE

Edition three of the " Manual " appeared in 1822. This is a volume of 536 pages, following the exact style of edition two except that in this issue the author did commence to add abbreviations for the names of various authorities on a fairly large scale; but still many names appeared with no indication as to who proposed them. He did not deem it necessary or even desirable to cite Linnaeus as an authority, but did rather consistently, although with a remarkably high percentage of error, render credit to post-Linnaean authorities. He also commenced to add certain synonyms in the form of footnotes and became more specific in relation to geographic distribution. Perhaps slightly nettled by reviews of his earlier work, most of all by that of Rafinesque, he says: " The language throughout this work is strictly my own. I acknowledge there is a kind of quaintness in the style, calculated to furnish a good subject for our liliputian reviewers." Genera were increased to 864, and species to 3,065.

EDITION FOUR

In edition four (1824) the preface to edition three is repeated, that to edition four being very short. He admits that there are few alterations in this edition, but he did add a concise grammar of botany and a vocabulary of technical terms. It does, however, contain an appendix, dated Feb. 1, 1824, pages 518 to 539, in which Lewis C. Beck, its actual author accepts various additions and corrections from Torrey's " Flora of the Northern and Middle States " (1824) which had appeared after Eaton's edition four had passed through the press. The total number of pages is 539. The chief differences between editions three and four, as to the included genera and species, appear to be in the appendix above mentioned.

---

[5] See the discussion of Eaton's herbarium below.

EDITION FIVE

Edition five (1829) is much the same as edition four, but as with each preceding issue, includes various added genera and species. In it 1,125 genera and 5,125 species are described. The descriptive part of the text consists of 452 pages, the " closing remarks " which include the errata, index, grammar of botany, and an innovation in the form of a summary of Jussieu's natural system of classification, comprising 63 additional pages, and to which must be added an unpaged botanical dictionary (69 pages), making a total of 584 pages. On page one of the closing remarks he credits the compilation, after *Carex,* largely to Dr. William Aikin and H. H. Eaton. This " closing remarks " page is dated May 13, 1829, which must be very close to the date of publication, as he said that the first proof-sheet was received on January 12, and that the book had been four months in the press.

His ideas regarding the status of descriptive botany, as expressed on page seven of the introductory part, make rather strange reading today: " Many vain botanists are continually in search of new species; and their vanity leads them into strange absurdities. . . . There is not, probably, 50 undescribed species of Phenogamous plants in the United States—perhaps not one species, east of the Mississippi." And this when the United States boundaries had been extended to Florida and Louisiana in the south, and to Colorado, Wyoming, and Montana in the west, with vast parts of this new territory as yet unexplored! Most of Torrey's descriptive work, as well as that of the younger Asa Gray, to say nothing of that of George Engelmann and many more, was still in the future.

EDITION SIX

This appeared in 1833, consisting of pages i-x, 33-103, 1-401, 1-138, or a total of 640 pages. The number of genera is increased to 1,228, and of species to 5,267 One radical change was the amplification of the synopsis of Jussieu's natural system of classification, which had first appeared in edition five. Here for the first time he segregated the genera of cellular cryptogams from the alphabetic arrangement of all generic names, and distributed them under the major groups of the natural system, the fungi, algae, lichens, mosses, and hepatics.

The interesting item in this edition is Eaton's remarkable diatribe against the natural system of classification and its supporters, that forms a part of the introduction. He apparently could not bring himself to an acceptance of the natural system as a whole, although by that time all of the productive botanists in the United States had long since abandoned the Linnaean artificial system of classification. Not being able to restrain himself, he opens this strange preface with the following statement:

"Since Dr. Faustus first exhibited his printed bibles in the year 1463, no book has, probably, excited such consternation and dismay, as Dr. Torrey's edition of Lindley's Introduction to the Natural System of Botany [1831]. And to make the horrors of students, as well as of ordinary teachers, still more appalling, Dr. Torrey's Catalogue of American Plants at the end of his Lindley, was so singularly presented, that it would seem to indicate an awful catastrophe to all previous learning. To relieve all concerned, let me make this pledge: Nothing new is presented either in the text or in the catalogue, excepting what ought to have been discovered in this *progressive* science, since the fifth edition of this Manual was printed; and not so much of *real improvement*, has been added, as between the fourth and fifth editions. A few *formidable* (and unnecessary) terms have been introduced, and a few new discoveries. Some genera have been split up with propriety—more from sheer vanity. . . . Throughout the whole work I have been careful to adopt the most current names.

"I shall not give a detailed account of the course I have taken. But I shall content myself by giving this assurance: I have made myself thoroughly acquainted with Lindley, Hooker, Loudon, and the four published volumes of De Candolle. I do not believe that either of these authors has published any improvement useful to the student in North American Botany, which he will not find in this book, excepting the physiological part. . . .

"It may be asked, why I do not follow De Candolle, *servilely*, since so many distinguished botanists here have borne testimony to his great merit? Perhaps no one is a more devoted admirer of his discriminating talents, great learning, and untiring assiduity, than myself. But he imposes on his readers the labor of learning a multitude of new names, without even a shadow of pretence. Then to sustain him in his unnecessary novelties, he flatters his adherents by adopting all their ridiculous names and whimsies, and by holding them up to the world as eminent botanists (I cannot be accused of envy, for he has quoted me with the rest). It is certainly the duty of everyone . . . to oppose the introduction of an overwhelming host of new and unutterable names, and to load our book-shelves with a still more frightful terminology. . . . As far as I have any influence I pledge it here, that the embarrassing innovations of De Candolle and others, are of no *possible use* to the science of Botany. All new discoveries, however (which are not a few) *should be adopted;* and they *are* adopted in this edition. And the *necessary* new names and new nomenclature, are also adopted and fully explained.

"An attempt is made by Lindley (who has given us a condensed view of all the discoveries of Robert Brown and others) to prove that the Artificial method of Linneus is unnecessary. In doing this he proposes an *Artificial Method* of eleven pages. As those who have not read Torrey's Lindley, will scarcely believe this unaccountable absurdity, they are requested to examine, unbiassed, that work. . . . The improvements upon Linneus, which have been made, do not authorize any change in the science of Botany, other than mere additions and corrections, like Newton's Principia."

Comment on this extraordinary statement would seem to be superfluous, other than to note that Eaton, the amateur, did not hesitate to express his frank opinion of the greatest professional botanists of the time. It is, however, an excellent illustration of Eaton's objections to innovations and improvements, in spite of his protestation that botany was a *progressive* science.

EDITION SEVEN

Edition seven appeared in 1836. The descriptive text consists of 672 pages, the botanical grammar and dictionary consisting of 125 additional pages, a total of 797. There are no striking innovations. The number of genera was increased to 1,291, and of species to 5,855. The remarkable preface of the sixth edition is replaced by a new one in which the author continues to defend the Linnaean system of classification, querying: "Is it not a faithful guide on journeying to the Elysian fields of Vegetable Physiology?" His own statement regarding his work (p. iv) is worthy of note:

> "It ought to be understood that from the beginning of the Author's services in the cause of Botany, he has never aspired to any thing above that of *teacher, translator* and *compiler*. He has made but few new discoveries and constructed but few species. Hence his Manual has consisted of a series of advertising sheets for aspiring botanists, and a repository of their discoveries."

EDITION EIGHT

The eighth and last edition was issued in 1840 under the joint authorship of Amos Eaton and John Wright. The volume is of somewhat larger format than the preceding editions, consisting of xviii plus 625 pages. The number of genera was increased to 1,325, and of species to 5,986. Other than in the additions of various genera and species originally described by other authors, and a few proposed by Eaton and Wright *de novo*, the text is much the same as that of the seventh edition. Eaton says regarding this volume, preface, p. vi: "Age, and declining vision, have admonished the author that he must call in the aid of youthful zeal, with talented energies, to supply his loss by the waning of years." This assistance was provided by the junior author, John Wright, who, doubtless, was responsible for much of the additional material. The main title was changed for the first time from "A Manual of Botany" to "North American Botany", the subtitle being: "Comprising the Native and Common Cultivated Plants, North of Mexico; Genera Arranged According to the Artificial and Natural Methods." In this paper we have used the abbreviation "Man." for "Manual" for all editions including the eighth and final one, except in those cases where a new name appears only in the eighth edition where the citation adopted is to "Eaton & Wright, N. Am. Bot."

ABBREVIATIONS

Eaton was interested in compactness in order to keep the selling price of the various editions of his " Manual " as low as possible. This is the reason for the very short descriptions, and for his often cryptic abbreviations for author's names and geographic areas. His author abbreviations are so different from those now currently used that it seems to be desirable to cite a few. Thus A = Aiton; B = Barton; Bl = Bridel; Bw = Bigelow; E = Elliott; G = Gronovius; Jn = Jacquin; Lk = Lamarck; M = Muhlenberg; Mr = Murray, etc.

Again, because he did not indicate geographic ranges for species in the first edition, commencing to do this in the second edition, the abbreviations were also cryptic. Thus H = Harvard College (Boston and vicinity); Y = Yale College (New Haven and vicinity); C = Columbia College (New York City and vicinity); W = Williams College (Williamstown and vicinity); with others such as N = Northampton, A = Albany, P = Pennsylvania, and O = *omnibus locis*. In later editions as the range of the manual was extended the same system was followed and we find various additions such as B = Boston; C = Connecticut; D = Delaware; D = Detroit and the " N. W. Lakes "; H = Harrisburg " and the Alleghany range in Virginia and Pennsylvania "; H = Highlands (Catskill and Green Mountains); K = Kentucky; M = Maryland; O = Ontario County, New York; N = New York; P = Philadelphia and Chester; T = Troy, New York; V = Rutland County, Vermont; and others. For species from other than eastern North America he also used A = Arctic and R = Rocky Mountains and west of that range and as far east as Missouri and Arkansas. In other editions A = Alpine, N = Northern, S = Southern, L = *littoralibus* (seacoast plants), etc. Somewhere in each edition he did explain the cryptic abbreviations that he used to save space, but in order to be sure what was intended, particularly when the same letter was used to indicate different localities or regions, his explanations should be consulted.

SOME EATONIAN ERRORS

Eaton's percentage of error in ascribing authorities to various binomials, after he initiated this practice in edition three, is very high. In a randon sampling involving somewhat more than 500 names which are accompanied by abbreviations of the author or supposed author, in 180 cases he credits the authorship to other than the originator of the combination, his errors being in excess of 25%. This was largely due to his unfortunate habit of crediting the authority for a name to the author of the book from which he compiled his descriptions. He seldom considered it necessary or desirable to cite any author for a Linnaean species, but it is noteworthy how frequently he credited a Linnaean name to Willdenow, Persoon, Pursh, or some other post-Linnaean author who had merely redescribed the Linnaean species; a Michaux binomial may be credited to " Ph." = Pursh merely because Eaton took his description from Pursh rather than from

Michaux's original work. An extraordinary number of specific names are erroneously credited to " W " = Willdenow, not that the latter author originated them but merely because Eaton compiled his descriptions from Willdenow's edition of the " Species Plantarum." He thus automatically credited Willdenow with being the author of the names when all that the latter did was to redescribe species proposed by earlier authors correctly crediting the names to them. In some cases, such as in *Aspidium* with a total of twenty-three names he was one hundred percent in error as to the authorities for the binomials.

As noted elsewhere he also had the unfortunate habit, when it became necessary to transfer a specific name from one generic name to another, of crediting the new combination to the author who originated the species name, when, in very many cases the author of the new name was actually Eaton himself. In no case does he indicate that he was publishing a new name, and it is only charitable to assume that he was unconscious of the fact that for such names he himself was the author by being the first person to publish the transfers. In some cases the source of his new name is indicated by a footnote reference; in other cases there is no indication whatever of the name-bringing synonym, and this can now be determined only by inference. This inconsistency on the part of Eaton in his treatment of transferred names, as to their authorities, has confused the issue. In some cases he accepted botanical usage and cited the authorities properly. Where he continued to cite the original author as the authority for a new combination he approximated zoological custom, without, however, the use of parentheses. Thus, modern botanists would generally utilize the form *Prunus emarginata* (Dougl.) Eaton, based on *Cerasus emarginata* Dougl.; but, were this a zoological name, it would appear as *Prunus emarginata* (Dougl.).

There are a considerable number of misspelled technical names of plants in all editions of Eaton's " Manual." He says under the errata, p. 164 of the first edition: " The reader will not be surprised at this [small] list of errors, when he is told that the author resides 34 miles from the printer, and never saw any of the proof sheets." The surprising thing is, perhaps, that errors were not more numerous, for Eaton's handwriting was not too clear. In general we have not listed manifestly misspelled names as " new " ones except in those cases where either the initial letter is involved or the name, as misspelled, was correctly formed; and for such entries we have added the abbreviation *sphalm.*

Illustrations of patent errors are *Aspidium crucitarium* (*A. cicutarium* Sw.), *Batschia imeling* (*gmelini*), *Blechnum surrulatum* (*B. serrulatum* Rich.), *Carex foena* (*foenea* Muhl.), *Citrus medeca* (*medica* Linn.), *Cucumis anguinis* (*anguinus* Linn.), *Delphinium staphisagrium* (*staphisagria* Linn.), *Diphyllia* (*Diphylleia* Michx.), *Gentiana pneumonantha* (*pneumonanthe* Linn.), *Holcus latnanus* (*lanatus* Linn.), *Ilex cassina* (*I. cassine* Linn., *I. cassena* Michx.), *Lepidium menziesia* (*menziesii* DC.), *Panasia* (*Parnassia* Linn.), *Plantago criopoda* (*eriopoda* Torr.), *P. meadia* (*media* Linn.), *Potentilla leneophylla* (*leucophylla* Torr.),

Pteris aqualina (*P. aquilina* Linn.), and *Pycnanthemum monardellum* (*monardella* Michx.). There are many others. Eaton apparently did not accept the precept that certain types of specific names are indeclinable, and rather consistently changed the case endings in such cases as *Delphinium staphisagria* Linn., *Gentiana pneumonanthe* Linn., and *Pycnanthemum monardella* Michx., cited above; there are many others in this category. Furthermore, he objected to the adjectival form of certain specific names, such as *Carex deweyana* Schwein., *C. halseyana* Dewey, and *C. hitchcockiana* Dewey, and changed them to the genitive form in *C. deweyi* Eaton, *C. halseyi* Eaton, and *C. hitchcockii* Eaton. If a species name impressed him as unduly long, such as *Carex washingtoniana* Dewey, it became *C. washingtonia* Eaton, in this case commenting: "Prof. Dewey will excuse me for shortening some of his personal and geographical names." Here apparently Eaton did not realize that he was actually publishing new names. Again, when he occasionally transferred specific names from one genus to another, such as from *Antennaria* to *Gnaphalium,* he left the specific names as they were under *Antennaria,* making no changes in the case endings.

Because Eaton elected to arrange his species under a strictly alphabetic sequence of genera, some strange new binomials appear here and there, where a species name with its accompanying description was accidentally included under the wrong genus. Examples are: *Apargia orontium* Eaton (Compositae) = *Antirrhinum orontium* Linn. (Scrophulariaceae), *Crataegus platycarpa* Eaton (Rosaceae) = *Crotalaria platycarpa* Link (Leguminosae), *Crotalaria flexuosa* Eaton (Leguminosae) = *Crataegus flexuosa* (Poir.) DC. (Rosaceae), *Decumaria alata* Eaton (Saxifragaceae) = *Delesseria alata* Lamx. (Algae), *Reseda micrantha* Eaton (Resedaceae) = *Ranunculus micranthus* Nutt. (Ranunculaceae), *Sisyrinchium humile* Eaton (Iridaceae) = *Sisymbrium humile* Hook. (Cruciferae), and *Sisyrinchium brachycarpum* Eaton (Iridaceae) = *Sisymbrium brachycarpum* Hook. (Cruciferae).

It was the strange case of *Crotalaria flexuosa* Eaton, a name that had been picked up by Rafinesque, that first attracted the attention of the senior author to the unlisted Eaton names. Occasionally, in order to determine what was intended in cases like these, a considerable amount of botanical detective work was involved.

EATON'S HERBARIUM

Eaton had some realization of the value and importance of herbarium specimens, yet no edition of his flora was based primarily on such material. Unlike the then young botanist John Torrey, and the latter's early associate, Asa Gray, he apparently never did build up a general reference herbarium. He says in the preface to edition two of his work, p. 5. 1818, that he then had specimens of about sixteen hundred species. These specimens, many of which are still extant, are mere snips, and are not to be thought of as complete or even reasonably complete specimens. His original herbarium, as mounted by him in four books, is now the property of his great grandson, Mr. George Eaton, and is actually deposited in the Osborn Botanical Laboratory at Yale University. Through the courtesy of Dr. E. W. Sinnott we have had the opportunity of examining it. From the material preserved it is clearly the original herbarium because it contains the original specimens on which a very few of Eaton's early species were based, including *Xylosteum solonis* Eaton which was described in edition one of his " Manual." It also contains some specimens representing species that were not described until 1822, e.g., *Sarracenia heterophylla* Eaton and *Potamogeton natans* Eaton. Printed on the back of each of the four volumes is the legend " A. Eaton's Herbarium." On the fly leaf of one volume is the signature of Sara C. Eaton, followed by the statement " From Rens. Institute, Troy, N. Y."

It is suspected that Eaton at first had this material preserved as loose specimens, but probably when the third edition appeared he arranged such of his specimens as he desired to preserve in accordance with the Linnaean classes, following the sequence of the genera in his " Manual," and then mounted these in four books, crowding several small specimens representing as many species on each sheet. Nearly all of the specimens are fragmentary, representing only very small parts of the species involved, sometimes reduced to a single leaf and a flower, or in some cases to a single leaf only. In many cases the name is written in abbreviated form in pencil, and not infrequently the mounted specimen actually covers a part of the pencilled entry. After the material was mounted the names, in Eaton's handwriting, were written in ink near each one. There are no labels, few dates or other information, and when a date is given it is usually that of the month of collection only. In general there is no indication of the collector, but in some cases Torrey's name appears, and in two cases there are specimens from Rafinesque accompanied by his manuscript descriptions, neither of which was ever published. Such localities as are given are in general indicated by letters, such as N. H. = New Haven, A = Albany, W = Williamstown, etc. In a very few cases the locality is indicated in full. For the vast majority of cases however, no locality is given.

This first Eaton herbarium consists of four books of about 90 pages each. It actually contains 1,237 species (some of the specimens have been lost or destroyed). In most cases the species appear to be correctly named in accordance with the nomenclature of the time. The books measure nine by eleven inches, being about two inches thick. There are usually three or four, sometimes six or more species mounted on each small sheet, and in the case of the cellular cryptogams as many as twenty or more on a single sheet.

At the time Eaton mounted the material it seems probable that he found some of his specimens representing his " sixteen hundred species " mentioned in edition two of his " Manual," 5. 1818, to be of such a nature that preservation was not indicated. On the whole this Eaton herbarium is apparently exactly the type that he required his students to prepare, if we may judge by the extant herbarium of David I. Coe (see below), who was a member of Eaton's natural history class at Williams College that published the first edition of the manual; except that in this extant Coe herbarium, now at the New York Botanical Garden, the specimens are very much better than are those in the Eaton collection.

Eaton preserved very few of his type specimens, for apparently he little realized the value of such material for subsequent study. It had been anticipated that we might find in this herbarium representatives of some of the Torrey, Hall, Aiken, Beck, Tracy, and Le Conte species that Eaton published, but there is nothing that we can associate with any of these botanists.

There is also a second Eaton herbarium, book one of which is preserved at Yale University. This covers classes I to X of the Linnaean system, and many of the species included in it are the same as those in the first Eaton herbarium. However, these later specimens are much better prepared and much more complete than the mere snips that form the first and larger herbarium. In this book 225 species are represented, but the general technique is little better, other than in more ample and better prepared specimens, than is the case with the earlier herbarium. That this Eaton herbarium is of a later vintage than the first is indicated by the fact that in a few cases actual dates are given, the latest one being 1834. For the most part only two or three specimens are mounted on the same page, sometimes only one, and only occasionally as many as four or five. All are labelled, the label taking the form of a slip of paper on which the name is written, sometimes with few other data, but always with the figures referring to the generic names used in the last edition of the Manual pasted over the lower end of each specimen. Very few localities are indicated. The handwriting is not that of Eaton, but the labels were probably prepared by John Wright. In the front of this book, in the form of loose sheets, is an index to both volumes of this herbarium, and this is in Eaton's characteristic handwriting. From this index it is evident that there were in Classes XI to XX, which apparently formed book two, about 278 specimens. This second book is not at Yale University. We have found no Eaton types in this second herbarium.

It was suspected at first that the book of Eaton specimens preserved at the Rensselaer Polytechnic Institute at Troy, New York, might form book two of this second Eaton herbarium, but from Mr. Gustafson's account[6] of it this cannot be the case. We have not seen this material but it is reported that the labels of the 111 specimens are in Eaton's handwriting, and that the collection was picked up by a soldier in a southern farm house during the Civil War. It may well be a part of another Eaton herbarium. However, in spite of the fact that the names are said to be in Eaton's handwriting we suspect that it is more likely that the collection was made by one of Eaton's students who took it home with him after finishing his studies, perhaps a parallel case with the Coe herbarium mentioned above. The latter was taken to Ohio by Mr. Coe and more than a century later was eventually discarded by one of his descendants in Ashland, Oregon. The method of mounting on coarse paper five by six inches in size, is not that which Eaton used in the two herbaria that we have examined.

---

[6] **Gustafson, A. H.** A Note on Amos Eaton's Herbarium. Rhodora **39**: 153-155. 1937.

Mr. Gustafson suspects that Amos Eaton may have made very extensive botanical collections in his wide travels, but we find no evidence of this. Apparently he never was much of a field botanist in the sense that he prepared extensive collections of herbarium specimens for permanent preservation. Such collecting as he did was on a relatively small scale, and even for the time this was very amateurish, if we may judge by what has been preserved. There are almost no Eaton specimens in the early American herbaria that have survived in Philadelphia and in New York.

It is clear from statements made in the introductions to the various editions of his Manual, especially editions four and six, that various individuals such as Messrs. Pitcher, Cooley, Clinton, Eights, Aikin, Torrey, Short, Peter, Riddell, Gibbs, Tully, Beck, Mead, and others sent him collections of botanical specimens, and we may judge that the aggregate would form a large herbarium had the specimens been preserved. It is evident from the fact that Eaton preserved only small scraps of the specimens, largely collected by himself, and that none of the specific collections that he mentioned as having received from others have been preserved, that he did not consider that such material was worthy of preservation. The probabilities are very great that either Eaton himself, or someone following him, discarded the collections that he had received as valueless. It is noteworthy that the extant Eaton herbarium actually contains specimens, and these very inadequate, representing only five of the forty new species that he described on his own account or for other authors who sent him specimens. Clearly, he had no concept of the value of type specimens, apparently considering that once a species was published it was not necessary to preserve the material on which the descriptions were based.

He apparently did not hold the herbarium botanist in very high esteem, although in edition four of his work p. iv. 1824, where he lists the names of those who sent him specimens and the regions from which the material came, he admits that he deprived more benefit from the specimens received by Dr. Torrey than from those received by himself. Fortunately for later generations of botanists Torrey realized the value of dried specimens even if Eaton did not, for what was sent to Torrey was carefully preserved. In the preface to edition seven, IV. 1836, he says: " He has however, improved the description[s] of more than six hundred species, by an immediate inspection of the plants while growing in the field. In doing this, he did not re-describe; but merely changed, added, or expunged a word or figure, as the case required. And even those trivial improvements were mostly made in consequence of suggestions, first made by his pupils during their analyzing exercises." The modern botanist might hesitate to accept some of Eaton's corrections for the simple reason that no proofs exist as to whether or not his identifications were correct.

In 1833, " Manual," ed. 6. p. viii, he pays his respects to the herbarium botanists thus: " Great numbers of errors are yearly added to our original stock, by closet-authors, who rely upon the dried specimens of the herbarium for their new names and new descriptions," and while tacitly admitting that such material was of value in that it " serves to revive our recollections of growing plants " he insists that herbarium specimens are " far from being a faithful guide in drawing descriptions and making nice distinctions." Here of course much depends on how much material is used, for it is apparent that Eaton was so little impressed with the value of reference material that he made no serious attempt to build up a comprehensive collection of herbarium specimens, much less to take steps to preserve such material for the benefit of posterity as did his much more distinguished student John Torrey, or Torrey's younger associate, Asa Gray. He was apparently ignorant of the fact that probably in excess of ninety to ninety-five percent of all original descriptions of plants were and still are based solely on herbarium specimens. Judged by any criterion, in comparison with such men who became pre-eminent as professional botanists, Amos Eaton was throughout his botanical career a sort of prince of amateurs, for his work was always amateurish as compared with that of his more professional contemporaries and successors in the field of plant science.

Conclusion

From various quotations from Eaton's work given above one gains the impression that he was an individual with rather fixed ideas, and whether right or wrong, he did not hesitate to express what he thought to be the case. A rather amusing instance in his statement, " Manual," ed. 3, 506. 1822, under *Verbascum thapsus*, and repeated in all later editions: " When botanists are so infatuated with wild theory, as to tell us the mullein was introduced, they give our youngest pupils occasion to sneer at their teachers." Eaton was positively of the opinion that this European species was native of North America, of course being wrong in this assumption, for all species of *Verbascum* are of Eurasian origin. We may return to Rafinesque's review of Eaton's work, Am. Monthly Mag. Crit. Rev. 1: 426. 1817: " It may be proper to hint, that students are not in general the best judges of what is most useful in their pursuits. What they deem such, may often prove otherwise, and they are but seldom enabled to detect the errors of their teachers, while they are taught to consider them as doctrines and truths." Whether Eaton was right or wrong in his statement as to his beliefs, we can only conclude that he was eminently dogmatic, and that a statement, once made, even if it be patently erroneous, was to be maintained regardless of what others might believe.

This paper is not planned as a critique of Eaton's botanical work, or of his accomplishments in other fields. All we have in mind is to list his new botanical names, particularly those that have hitherto been overlooked, with indicated reductions. In this we believe that we have been reasonably successful, for in this paper about 150 previously unlisted Eaton names are recorded, while at the same time about 35 corrections of one type or another to the places of publication of his names have been noted.

When the work was initiated we had no reason to suppose that the totals of overlooked or erroneously listed names would be so large. The actual listing of these names at this late date but rarely affects the status of currently accepted names for this or that species. In a few cases Eaton actually becomes the authority for certain binomials, because he made the transfers earlier than those authors to whom they are currently accredited, examples being: *Bartonia paniculata* (Michx.) Muhl. ex Eaton, 1822; B. L. Robinson, 1908, and *Prunus emarginata* (Dougl.) Eaton, 1836; Walpers, 1843. We note three cases where the application of the homonym rule will require new specific names for other than the species Eaton named. Thus, *Cleome erosa* Eaton (1836) invalidates the name *C. erosa* Urban (1912) for a species from Santo Domingo; *Corydalis rosea* Eaton (1817) that of the eastern Asiatic *C. rosea* Maxim. (1878); and *Eupatorium gracile* Torr. ex Eaton (1818) that of the South American *E. gracile* H. B. K. (1820). Such instances emphasize the importance of at least listing all early and validly published generic names and binomials, which is, of course, the objective of such an indispensable work as " Index Kewensis."

Although Eaton proposed on his own account, or published for others, eight new generic names and more than 200 binomials, three fourths of which have remained unlisted for more than a century, the chief contribution of this paper is in the form of additions to the burden of synonymy. Very few of the Eaton proposals have any bearing whatever on the currently accepted names of plants. He was peculiarly unfortunate in the new generic names that he originated, such as *Chrysocopsis, Morellus, Pickeringa, Torreya, Touterea,* and *Vexillaria,* as well as *Adesia* Raf. and *Eatonia* Drayton that he also published, for not one stood the test of time, and, at least under currently accepted rules of procedure, the actual publication of not a single one of these was justifiable.

On his own account he also proposed and described about twenty new species and published an equal number for other botanists, such as Torrey, Le Conte, Aikin, Hall, and others. In addition he here and there deliberately published some new names for earlier described species where this was considered to be advisable. Only one of his new species holds with the name unchanged, this being *Lonicera hirsuta* Eaton. Several others among his new species are widely accepted as valid, either as species, varieties, or forms, but under generic designations different from those Eaton used, these being *Desmanthus cooleyi* (Eaton) Rydb., *Rorippa aquatica* (Eaton) Palmer & Steyerm., *Besseya bullii* (Eaton) Rydb., *Sarracenia purpurea* Linn. var. *heterophylla* (Eaton) Torr., *Lonicera villosa* Roem. & Schult. var. *solonis* (Eaton) Fernald, and *Polygonum amphibium* Linn., var. *stipulaceum* Colem., forma *fluitans* (Eaton) Fernald. Eaton *deliberately* published about 50 new generic and specific names; the total number that he *actually* published was about 210. The difference is largely due to the transfers that he had to make when here and there generic limits were altered, and he accepted this or that name for segregated groups. As noted elsewhere in this paper when such transfers were made he unfortunately credited the authority for the new name to its original author. It is in this class that most of the new Eaton binomials have been overlooked by previous bibliographers, for there is no evident reason for even thinking that this or that name should be considered as a new one. About 25 of Eaton's new names were due entirely to errors of one type or another in transcribing the data or to errors that remained undetected when the proofs were read.

Of about 210 new names actually published by Eaton between the years 1817 and 1840, slightly in excess of 150 do not appear in any of our standard indices. Of between the 50 and 60 species that are listed about 35 references need to be altered, as the entries are not to the first place of publication; only about 20 entries are correct. A few corrections have also been noted in the listed places of publication of species of other authors, notably Muhlenberg. We further note about 20 unlisted new binomials in the works of Pursh, Nuttall, Elliott, Muhlenberg, Wood, and others appertaining to the North American flora. It was not expected, however, that in the course of checking the Eaton references we would locate a considerable number of fugitive names in papers published between the years 1827 and 1879 appertaining strictly to the European flora. In this extralimital field we record 22 unlisted binomials and a dozen cases where the binomials were published earlier than the entries in Index Kewensis indicate. The total number of unlisted names noted in this paper is approximately 250, and corrections to entries already made are about sixty.

As to reductions, in spite of Eaton's always amateurish work, in spite of his short descriptions, in spite of the fact that exact localities were usually not indicated, in spite of his very sketchy synonymy, and in spite of the fact that he failed to preserve voucher specimens for most of his new entities, most of his new names have been safely placed. A very few of the unplaced " new species " remain that perhaps future specialists may succeed in interpreting, an example being *Helianthus ballii* Eaton, Man. ed. 7, 329. 1836, type from " R " = " On the Rocky Mt. or west of it; or between the Mt. and the states of Missouri and Arkansas."

The distinctly amateurish type of publication that Eaton initiated in the first edition of his " Manual " persisted through all eight editions. The very fact that so many editions appeared over a period of twenty-two years indicates that his labors were appreciated, and that there was a distinct demand for a publication of the type that he fostered. In the preface to edition eight, vi. 1840, it is stated that of the preceding five editions 2,000—and of one edition 2,500— copies were printed. Eaton elsewhere stated regarding the first edition that only about 500 copies of this were printed, but again gave the figure as 1,000. Probably 18,000 copies would be a liberal estimate for the total number of copies printed covering all eight editions of the Manual.

In the meantime, however, under the leadership of Dr. John Torrey a series of more technical, authoritative, and more complete descriptive texts had commenced to appear, culminating in the Torrey and Gray " Flora of North America," 1838-43, to be followed later by the even more comprehensive " Synoptical Flora of North America " by Asa Gray, neither of these ever completed because of the very magnitude of the projects. Certainly by the time the last Eaton and Wright edition appeared in 1840, the Eaton method of presentation had long since been outmoded. The very fact that in this last edition there were included 1,325 genera and 5,986 most inadequately described species, and that they attempted to include all known species for North America north of Mexico, made the work an impracticable one even for the amateurs for whom it was prepared. It later became evident that no one author could expect to cover the entire field because of the very extent of the area and the richness of the flora.

To a very considerable degree these vast undertakings were replaced by restricted local floras such as the various editions of Wood's " Class-Book of Botany," commencing in 1845, Gray's " Manual " commencing in 1848, Chapman's " Flora of the Southern States " in 1860, and others. Today most parts of the country are supplied with descriptive floras of one type or another. We should, however, keep in mind that for the country as a whole, Eaton was the first American to realize the need of a popular descriptive work covering more than a local area, no matter what its defects were. He, not a trained botanist, had the courage of his convictions, for he did produce what was for its time apparently a useful work, no matter what the imperfections of the various editions may be.

We repeat that in recording the numerous, for the most part unlisted, and hence currently overlooked Eaton binomials, we are adding chiefly to the burden of synonymy, but because we do have an approved homonym rule that was in general insisted upon by American botanists, we feel that these long overlooked names should be at least listed. Much remains to be done in this field, particularly in reference to the earlier post-Linnaean publications on North American botany. Even among the more recent publications attention is called to the fact that various editions of Wood's " Class-Book of Botany " (1845-1877) contain a considerable number of unlisted new names which it is hoped that some one some day may detect; or if one wishes to be even more modern, it is reported that there are unlisted new names published under the aegis of the late Dr. F. V. Coville in the " Century Dictionary Supplement " (1909)! We extend our sympathy to those few botanical bibliographers in the world whose duty it is to list all validly published technical names of plants, whether for the world at large or for the Americas alone. It is they who suffer from the strange idiosyncrasies of the taxonomists, some of whom publish their lucubrations, as Rafinesque called them, in strange places, to the utter confusion of those who labor in the vineyard of recording new names and their places of publication.

PTERIDOPHYTA

Athyrium *atomarium Eaton,[7] Man. ed. 3, 197. 1822; ed. 4, 225. 1824 = *Cystopteris bulbifera* (Linn.) Bernh.

No authority is cited and no synonym is given. Eaton's specimen was from Pennsylvania. In editions five to eight it appears as *Aspidium atomarium* still with no indication of the origin of the name. Clearly its basis was *Aspidium atomarium* Muhl. ex Willd., Sp. Pl. **5:** 379. 1810.

Athyrium *bulbiferum Eaton, Man. 122. 1817; ed. 2. 163. 1818; ed. 3, 197. 1822; ed. 4, 224. 1824 = *Cystopteris bulbifera* (Linn.) Bernh.

As in the preceding case no authority is indicated nor is any synonym cited. It became *Aspidium bulbiferum* in ed. 5, 120. 1829, and in succeeding editions, the authority erroneously indicated as " W " = Willdenow; it is *Aspidium bulbiferum* Sw. (1801). The name *Athyrium bulbiferum* (Brackenr.) Copel. in Bishop Mus. Bull. **59:** 53. 1929, used for a widely distributed species of the Old World tropics, is invalidated by Eaton's earlier use of it for a totally different species.

Athyrium *punctilobum Eaton, Man. ed. 2, 163. 1818; ed. 3, 197. 1822; ed. 4, 225. 1824 = *Dennstaedtia punctilobula* (Michx.) Moore.

Here again Eaton cited no synonym and indicated no authority for the name. It became *Aspidium punctilobum* in ed. 5, 120. 1829, the " S " here added indicating the southern United States. Clearly *Aspidium punctilobum* Willd., Sp. Pl. **5:** 279. 1810, was Eaton's source (*Nephrodium punctilobulum* Michx., 1803; *Aspidium punctilobulum* Sw., 1806).

Athyrium *rufidulum Eaton, Man. 122. 1817; ed. 2, 163. 1818; ed. 3, 197. 1822; ed. 4, 225. 1824 = *Woodsia ilvensis* (Linn.) R. Br.

There is no indication as to the sources of this name. In later editions it became *Aspidium rufidulum,* still without citation of authority. It may safely be assumed that its basis was *Nephrodium rufidulum* Michx. (1803) = *Aspidium rufidulum* Sw. = *Woodsia ilvensis* (Linn.) R. Br.

Athyrium *tenue Eaton, Man. 122. 1817; ed. 2, 163. 1818; ed. 3, 197. 1822; ed. 4, 225. 1824 = *Cystopteris fragilis* (Linn.) Bernh. var. *mackayii* Laws.

No authority is given nor is any synonym cited. In edition five and all later issues it became *Aspidium tenue,* still without citation of an authority until edition eight appeared, where it is erroneously credited to " W " = Willdenow. Its basis was clearly *Nephrodium tenue* Michx. (1803) = *Aspidium tenue* Sw., 1806 = *Cystopteris tenuis* Desv. (1827). The reduction to Lawson's variety is by Mr. Weatherby, Lawson having published this in his " Fern Flora of Canada " 233. 1889; the case is considered by Weatherby in Rhodora **37:** 377. 1935. Here he cites as a synonym: " *Athyrium tenue* Presl Rel. Haenk. i. 39, in obs. (1825) ", a binomial not listed in Christensen's " Index Filicum." The Presl entry follows the description of *Athyrium fumaroides,* thus: " Affine *A. tenui* et *fragili;* a priore differt pinnulis pinnatifidis, soris dorso laciniarum insidentibus." There is no description of *Athyrium tenue* Presl, and no indication as to the origin of the specific name though this was undoubtedly *Aspidium tenue* Sw. In any case Eaton's use of the same binomial has eight years priority.

Hypopeltis *obtusa Torr., Compend. Fl. North. Mid. States 380. 1826; Eaton, Man. ed. 5, 253, 1829; ed. 6, 185. 1833; ed. 7, 347. 1836; ed. 8, 281. 1840 = *Woodsia obtusa* (Spreng.) Torr.

Eaton cited no authority. He apparently did not realize that Torrey had treated the species as *Hypopeltis* three years earlier, merely stating: " Described under Aspidium obtusum," which appears on page 119. In editions six, seven, and eight, he cites " Aspidium obtusum 5th Ed." as a synonym. Torrey's binomial does not appear in Christensen's " Index Filicum."

---

[7] Additions to standard indices are indicated by the sign (*), corrections by the sign (†).

In earlier editions of Eaton's work it appears as *Aspidium obtusum,* with the authority erroneously indicated as " W " = Willdenow. It is *Aspidium obtusum* Sw., Syn. 420. 1806, the basis of the latter being *Polypodium obtusum* Spreng. (1804). Torrey did not cite the name-bringing synonym in his treatment of 1826 but did provide a description; there is no doubt as to the source of the specific name.

Lycopodium *celago Eaton, Man. ed. 6, 215. 1833; ed. 7, 382. 1836; ed. 8, 309. 1840, *sphalm.* = *Lycopodium selago* Linn.

Merely an undetected typographical error; the entry in ed. 5, 286. 1829 is correct as *Lycopodium selago* Linn.

Schizaea tortuosa Pursh ex Muhl., Cat. 98. 1813, *nomen nudum*; ed. 2, 102. 1818, *nomen nudum*; Eaton, Man. 123. 1817, *descr.* "(one-sided fern) frond simple, spikes one-way" = *Schizaea pusilla* Pursh, Fl. Am. Sept. **2**: 657. 1814.

In all later editions of Eaton's " Manual " this appears as *Schizaea pusilla* Pursh. In both editions of Muhlenberg's work the name is credited to Pursh, but is strictly a *nomen nudum.* It may be assumed that *Schizaea tortuosa* was a Purshian manuscript or herbarium name, which was abandoned when he actually published the species as *Schizaea pusilla.* This is a minor correction to the confused entry in Christensen's " Index Filicum " 617. 1906, where it apears as "*tortuosa* Mühl. Cat. 102. 1813 (1818 nomen?) = *S. pusilla.*"

SPERMATOPHYTA

Acacia †cooleyi Eaton, Man. ed. 5, 89. 1829; ed. 6, 1. 1833; ed. 7, 139. 1836; ed. 8, 111. 1840 = *Desmanthus jamesii* Torr. & Gray (1840) = *Desmanthus cooleyi* (Eaton) Rydb. in Brittonia **1**: 90. 1931.

The Index Kewensis reference is to Eaton's " Manual " ed. 6, 1. 1833, as is that of Rydberg. The original description was based on that of " Acacia *n. sp. Nutt. mss.*" Torr. in Ann. Lyc. Nat. Hist. N. Y. **2**: 191. 1827; the type was collected by Dr. James from the sources of the Canadian River, in what is now Oklahoma.

Acerates *lanceolata Eaton, Man. ed. 5, 90. 1829; ed. 6, 3. 1833; ed. 7, 141. 1836; ed. 8, 112. 1840 = *Asclepias viridiflora* Raf.

This binomial was erroneously credited to Ives, the latter's name being *Asclepias lanceolata* Ives in Am. Jour. Sci. **1**: 252, *pl.* 1819, non Walt. (1788). It is a form of *Asclepias viridiflora* Raf. *Acerates viridiflora* Eaton, var. *ivesii* Britton in Mem. Torr. Bot. Club **5**: 265. 1894, and *Acerates ivesii* Wooton & Standley, are synonyms.

Acerates *nuttalliana Eaton, Man. ed. 5, 90. 1829; ed. 6, 3. 1833; ed. 7, 141. 1836; ed. 8, 113. 1840 = *Asclepias nuttalliana* Torr. (*Acerates monocephala* Lapham ex A. Gray).

Eaton credited the binomial to " T " = Torrey, the source being *Asclepias nuttalliana* Torr. in Ann. Lyc. Nat. Hist. N. Y. **2**: 218. 1827, with type from the sources of the Canadian River in what is now Oklahoma.

Acerates *obovata Eaton, Man. ed. 6, 3. 1833; ed. 7, 141. 1836; ed. 8, 113. 1840 = *Asclepias obovata* Ell.

Eaton erroneously credited the name to " E " = Elliott, citing no synonym. Its basis manifestly was *Asclepias obovata* Ell.

Acerates *viridiflora Eaton, Man. ed. 5, 90. 1829; ed. 6, 2. 1833; ed. 7, 140. 1836; ed. 8, 112. 1840 = *Asclepias viridiflora* Raf. (1808).

Eaton credits the binomial to " Ph." = Pursh, *Asclepias viridiflora* Pursh (1814) being the source of the specific name; but Rafinesque had published the same binomial for the same species six years earlier. The " Index Kewensis " entry *Acerates viridiflora* " Ell. Sketch 317 " is erroneous for all that Elliott said in 1817 was: " The *Asclepias viridiflora* of Pursh appears to belong to this genus [*Acerates*] ".

Achyranthes *vermicularis Ell., Sketch **1**: 310. 1817; Eaton, Man. ed. 5, 91. 1829 = *Philoxerus vermicularis* (Linn.) Beauv.

Eaton cites no authority. The name was undoubtedly taken from Elliott's binomial, as yet unlisted, which was based on "*Gomphrena vermicularis*, Sp. Pl. 1. p. 1322," this being the Willdenow edition of 1798. This, in turn, was based on *Illecebrum vermiculatum* Linn., Sp. Pl. ed. 2, 300. 1762, and the latter, in turn, on *Gomphrena vermicularis* Linn., Sp. Pl. 224. 1753. It is currently known as *Philoxerus vermicularis* (Linn.) R. Br., but Robert Brown did not effect the actual transfer in 1810, merely stating that *Gomphrena brasiliensis* and *vermicularis* belonged in *Philoxerus*. Palisot de Beauvois seems to have been the first botanist to publish *Philoxerus *vermicularis* (Linn.) Beauv., Fl. Oware Benin **2**: 65. 1818, this antedating the considerations by Martius and by Moquin.

***Adesia** Raf. ex Eaton, Man. ed. 3, 499. 1822; ed. 4, 489. 1824; ed. 5, 430. 1829; ed. 6, 377. 1833; ed. 7, 572. 1836; ed. 8, 465. 1840 = *Adicea* Raf. (1815) = *Pilea* Lindl. (1821), *nom. conserv.*

Adesia *trinerva Raf. ex Eaton, ll.cc. = *Adicea trinerva* Raf. = *Pilea pumila* (Linn.) A. Gray.

The spelling of the generic name as *Adesia* was probably due to an error on Eaton's part which remained undetected between 1822 and 1840. The entry appears only in the form of a footnote in synonymy.

Aesculus *monostachya Eaton, Man. ed. 5, 94. 1829, *sphalm.* = *A. macrostachya* Michx. = *A. parviflora* Walt.

The error was corrected to *A. macrostachya* in editions six to eight.

Agrostis †longifolia Torr., Fl. U. S. **1**: 90. 1824; Eaton, Man. ed. 5, 99. 1829; ed. 6, 9. 1833; ed. 7, 147. 1836; ed. 8, 118. 1840 = *Sporobolus asper* (Michx.) Kunth.

The Index Kewensis entry is to the much later reference, "Torr. ex A. Gray, Man. ed. 1, 575 [1848]." Hitchcock, Man. Grasses U. S. 958. 1935, cites Torrey's original place of publication correctly.

Allionia *multiflora Eaton, Man. ed. 5, addend. 2. 1829; ed. 6, 11. 1833; ed. 7, 150. 1836; ed. 8, 119. 1840 = *Mirabilis multiflora* A. Gray = *Quamoclidion multiflorum* Torr.

Authorship was credited to "P [T] & J" = Torrey & James, the basis of the name being *Oxybaphus multiflorus* Torr. in Ann. Lyc. Nat. Hist. N. Y. **2**: 237. 1827, with type collected by Dr. James at the forks of the Platte River (Colorado).

Amaryllis *atamasco Linn., Sp. Pl. ed. 2, 420. 1762; Eaton, Man. 37. 1817; ed. 2, 133. 1818; ed. 3, 170. 1822; ed. 4, 200. 1824; ed. 5, 103. 1829; ed. 6, 14. 1833; ed. 7, 152. 1836; ed. 8, 121. 1840 = *Zephyranthes atamasco* (Linn.) Herb.

This is a minor variant scarcely worthy of record, except to indicate that the original *Amaryllis atamasca* Linn., Sp. Pl. 292. 1753 was corrected to *A. atamasco* by Linnaeus in 1762. *Amaryllis atamasco* sensu Blanco (1837) is a *Hippeastrum*.

Antirrhinum *trianthophorum Eaton, Man. ed. 5, 109. 1829; ed. 6, 22. 1833; ed. 7, 161. 1836; ed. 8, 128. 1840, *sphalm.* = *A. triornithophorum* Linn.

There are other errors in earlier editions in *triornithoporum* ed. 3, 176. 1822, and *triornothophorum* in ed. 4, 206. 1824. The only correct entry is in ed. 2, 139. 1818.

Apargia *orontium Eaton, Man. ed. 5. 109. 1829; ed. 6, 22. 1833; ed. 7, 162. 1836; ed. 8, 129. 1840 = *Antirrhinum orontium* Linn.

This *Apargia* name was due to an error in Eaton's placing the entry under the wrong generic heading, *Apargia* belonging in the Compositae, *Antirrhinum* in the Scrophulariaceae.

Arabis *hastata Torr. ex Eaton, Man. ed. 2, 141. 1818; ed. 3, 178. 1822; ed. 4, 207. 1824 = *Arabis laevigata* (Muhl.) Poir.

" Found at Fiskill [New York] by Dr. John Torrey.—New species." No authority is cited, but it is quite certain that the binomial was originated by Torrey rather than by Eaton. In editions three and four, as a footnote, the synonymy is given as " pendula, N. Turritis laevigata W."; nowhere does Eaton cite an authority for *Arabis hastata.*

Artemisia *absynthium Eaton, Man. ed. 1, 91. 1817; ed. 2, 146. 1818; ed. 3, 182. 1822; ed. 4, 211. 1824; ed. 5, 115. 1829, *sphalm.* = *A. absinthium* Linn.

A minor variant in the spelling of the specific name scarcely worthy of record. The entries in editions six to eight are correct as *A. absinthium.*

Artemisia *douglassii Eaton, Man. ed. 7. 171. 1836 (*sphalm., douglassii*); ed. 8, 136. 1840 = *A. douglassiana* Bess. (1834) = *A. ludoviciana* Nutt. (1818).

A deliberate change in the spelling of Besser's specific name, for Eaton disapproved of the adjectival form.

Arum *walteri Ell., Sketch **2**: 631. 1824; Eaton, Man. ed. 5, 116. 1829; ed. 6, 31. 1833; ed. 7, 173. 1836; ed. 8, 138. 1840 = *Peltandra walteri* Raf. = *P. virginica* (Linn.) Kunth.

The basis of Elliott's hitherto overlooked specific name was *Arum sagittifolium* Walt., Fl. Carol. 224. 1788, or at least what he took to represent Walter's species.

Arundo *conoides Eaton, Man. ed. 2, 147. 1818 = *Calamagrostis cinnoides* (Muhl.) Barton.

This was clearly an error, *Arundo cinnoides* Muhl. being intended, as in edition 3, 183. 1822, in a footnote from *Arundo canadensis* Michx. is the entry " cinnoides, M. Calamagrostis canadensis, N."

Baptisia †coerulea Eaton, Man. ed. 3, 201. 1822; ed. 4, 228. 1824; ed. 5, 132. 1829; ed. 6, 50. 1833; ed. 7, 194. 1836; ed. 8, 154. 1840 = *Baptisia australis* (Linn.) R. Br.

The binomial was credited to Michaux, the footnote reference being to " australis, W." Its basis was clearly *Podalyria caerulea* Michx. The Index Kewensis entry is " Eaton & Wright, Man. N. Am. Bot. 154 [1840]."

Bartonia *paniculata Muhl., Cat. 16. 1813, *nomen nudum*; ed. 2, 15. 1818, *nomen nudum*; Eaton, Man. ed. 1, 8. 1817; ed. 2, 170. 1818; ed. 3, 202. 1822; ed. 4, 229. 1824; ed. 5, 132. 1829; ed. 6, 51. 1833.

It is only by inference that Muhlenberg's original publication of *Bartonia paniculata* could be accepted, it being at least a semi-blind transfer, the Michaux synonym not cited. The entry is: " Bartonia (centaurella Mx.) 1. verna, 2. paniculata." Fernald and Weatherby, in Rhodora **34:** 165. 1932, accept this as a valid transfer, *Bartonia paniculata* (Michx.) Muhl. Cat. 16. 1813. The Eaton consideration of 1817 consists merely of the statement " Bartonia, or Centaurella . . . *Paniculata,* (screw-stem) stem square. W." An amplified description appeared in edition two, but with no synonymy. In 1822 the authority is given as " M " = Muhlenberg, and the synonymy as given in the footnote is: " tenella, P. Andrewsia paniculata, B. Centaurella paniculata, Mx. C. autumnalis, Ph. Sagina virginica, W. Centaurium, P. in another part of his works." If the Muhlenberg publication of 1813 be unacceptable, then clearly here Eaton saves the day for him. In the text Eaton mildly chides the taxonomists thus: " It is thought best to retain this name [*Bartonia paniculata* Muhl.], until the fancies of our *verbifacient* botanists shall become so nearly stationary, that one or two changes more may settle upon this little plant a permanent name." In 1833 he argued further for the acceptance of Muhlenberg's name. *Bartonia paniculata* (Michx.) Muhl., replaces *Bartonia paniculata* (Michx.) B. L. Rob., Rhodora **10:** 35. 1908.

Bignonia *crucifera Eaton & Wright, N. Am. Bot. 157. 1840, *sphalm.* = *B. crucigera* Linn.

The entry is correct in editions five to seven of Eaton's Manual. The Linnaean species is the type of the genus *Bignonia;* see Sprague in Jour. Bot. **60:** 236-238. 1922. *Anisostichus* Bur., 1864, and *Doxantha* K. Schum., 1894, non Miers, 1863, are synonyms.

Borkhausia *grandiflora Nutt. in Jour. Acad. Nat. Sci. Phila. **7**: 69. 1834; Eaton, Man. ed. 7, 201. 1836; ed. 8, 159. 1840 = *Pyrrhopappus grandiflorus* Nutt. = *P. scaposus* DC.

The type of Nuttall's species was collected by Dr. Pitcher in Arkansas. It was transferred by Nuttall to *Pyrrhopappus* in 1841. The correct spelling of the generic name is *Barkhausia* Moench.

Brachyris *sarothrae Eaton, Man. ed. 5, 140. 1829; ed. 6, 58. 1833; ed. 7, 202. 1836; ed. 8, 160. 1840 = *Gutierrezia euthamiae* Torr. & Gray = *G. sarothrae* (Pursh) Britton & Rusby.

Eaton states "Taken from Solidago." He erroneously credits the authorship of the binomial to "Ph." = Pursh; the footnote reference is to *Solidago sarothrae* Pursh.

Bunias *edentata Eaton, Man. ed. 5, 142. 1829, *sphalm.* = *B. edentula* Bigel. = *Cakile edentula* (Bigel.) Hook.

In editions one, three, four, and six the entries are correct as *B. edentula* Bigel.

Bunias *maritima Eaton, Man. ed. 2, 181. 1818; ed. 5, 142. 1829; ed. 6, 60. 1833; ed. 7, 204. 1836 = *Cakile maritima* Scop. *quoad nomen, C. edentula* (Bigel.) Hook., *quoad descr.*

No synonyms are cited, the binomial being accredited to Willdenow in the later editions. The description was in all probability taken from *Cakile maritima*, sensu Pursh, Fl. Am. Sept. **2**: 208. 1814, non Scop.

Caladium *glaucum Ell., Sketch **2**: 631. 1824; Eaton, Man. ed. 5, 144. 1829; ed. 6, 62. 1833; ed. 7, 206. 1836; ed. 8, 164. 1840 = *Peltandra *glauca* (Ell.) Feay ex Wood, Class-Book 669. 1861; Small, Man. Southeast. Fl. 246. 1933.

Eaton correctly cited the authority as Elliott. It is indeed curious that the two binomials have remained unlisted in any of our standard indices up to this time; see p. 28.

Calamagrostis †coarctata Torr. ex Eaton, Man. ed. 5, 144. 1829; ed. 6, 62. 1833; ed. 7, 206. 1836; ed. 8, 164. 1840 = *C. cinnoides* (Muhl.) Barton.

The Index Kewensis entry is to "Torr. Fl. N. Y. ii. 444. [1843]" while Hitchcock gives its place of publication as in Hooker, Fl. Bor. Am. **2**: 240. 1840. It was originally described as *Arundo coarctata* Torr., Fl. U. S. **1**: 94. 1824. Eaton credits the binomial to Torrey, the footnote reference being "cinnoides B.-canadensis, N.-Arundo stricta, Sl. glauca, M.," these data certainly being taken from Torrey's original 1824 consideration of the species.

Carex carltoniana Eaton ex Jacks, Ind. Kew. **1**: 429. 1893 = *C. carltonia* Dewey, in Am. Jour. Sci. **27**: 238. 1834-35; **28**: 273. 1836; Eaton, Man. ed. 7, 219. 1836; ed. 8, 174. 1840 = *C. heleonastes* Linn. f.

The "Index Kewensis" name is a correction of Dewey's original entry, the type being from Carleton House, Saskatchewan.

Carex deweyi Eaton, Man. ed. 5, 150. 1829; ed. 6, 69. 1833; ed. 7, 215. 1836; ed. 8, 171. 1840 = *Carex deweyana* Schwein. (1824).

This was a deliberate change of Schweinitz's specific name due to Eaton's objection to the adjectival form, *deweyana*. He cites the authority as "Sz." = Schweinitz. It is correctly entered in "Index Kewensis," Suppl. 8.

Carex halseyi Eaton, Man. ed. 5, 157. 1829; ed. 6, 77. 1833; ed. 7, 224. 1836; ed. 8, 177. 1840 = *C. halseyana* Dewey (1826) = *C. polymorpha* Muhl. (1817).

A deliberate change in the form of the specific name on the part of Eaton. It is correctly entered in "Index Kewensis," Suppl. 8.

Carex hitchcockii Eaton, Man. ed. 5, 158. 1829; ed. 6, 78. 1833; ed. 7, 225. 1836; ed. 8, 179. 1840 = *C. hitchcockiana* Dewey (1826).

A deliberate change on the part of Eaton in the form of the specific name. Correctly entered in "Index Kewensis," Suppl. 8.

Carex *oakesii Eaton, Man. ed. 6, 78. 1833; ed. 7, 225. 1836; ed. 8, 178. 1840 = **seq.**

Carex okesii Eaton, Man. ed. 5, 157. 1829 = *C. okesiana* Dewey (1828) = *C. oligosperma* Michx. (1803).

A deliberate change in the form of the specific name on the part of Eaton. Correctly entered in " Index Kewensis," Suppl. 8.

Carex schweinitzia Eaton, Man. ed. 5, 159. 1829; ed. 6, 79. 1833; ed. 7, 226. 1836; ed. 8, 179. 1840 = *C. schweinitzii* Dewey.

A minor change in the form of the specific name by Eaton. Correctly entered in " Index Kewensis," Suppl. 8.

Carex washingtonia Eaton, Man. ed. 5, 156. 1829; ed. 6, 77. 1833; ed. 7, 224. 1836; ed. 8, 177. 1840 = *C. washingtoniana* Dewey (1826) = *C. concolor* R. Br. (1823).

Eaton says " Prof. Dewey will excuse me for shortening some of his personal and geographical names by substituting genitives. In this case, I believe, the adjective may be properly made Washingtonius, &c." The name is correctly entered in " Index Kewensis," Suppl. 8.

Carya *squamosa Eaton, Man. ed. 3, 225. 1822; ed. 4, 250. 1824 = *Carya ovata* (Mill.) K. Koch.

This was credited by Eaton to Michaux and his footnote reads " compressa, W. squamosa, Mx. arb." These are *Juglans compressa* Gaertn. as interpreted by Willdenow and *J. squamosa* Poir. (1798).

Cerastium *dichotomum Muhl., Cat. 46. 1813, *nomen nudum*; ed. 2, 47. 1819, *nomen nudum*; Eaton, Man. ed. 2, 199. 1818; ed. 3, 232. 1822; ed. 4, 256. 1824; ed. 5, 168. 1829; ed. 6, 88. 1833; ed. 7, 235. 1836, non Linn., nec Crantz, nec Schanqin.

There is no indication that Muhlenberg intended this to represent a new species. It is suspected that he had what he took to be the European (Linnaean) species. However, Eaton credits the species to " M " = Muhlenberg and thus validated the binomial, which at the time was, of course, untenable.

Cerasus *cerasus Eaton & Wright, N. Am. Bot. 189. 1840 = *Prunus cerasus* Linn.

The basis of this was *Prunus cerasus* Linn. It is suspected that this publication of a tautonym, which is the earliest case we have noted in botanical literature, was due to inadvertence on the part of the authors.

Cerasus littoralis Eaton & Wright, W. Am. Bot. 189. 1840 = *Prunus maritima* Marsh. (1785); Wangenh. (1787).

The basis was *Prunus littoralis* Bigel. (1824), Eaton and Wright citing the authority as " BW " = Bigelow, and at the end of the description *" Prunus, littoralis."* In a footnote *P. sphaerocarpa* Michx. is given as a doubtful synonym. Correctly entered in " Index Kewensis."

Cerasus umbellata Eaton & Wright, N. Am. Bot. 190. 1840 = *Cerasus umbellata* Torr. & Gray, Fl. N. Am. **1**: 409. 1840 (June) = *Prunus umbellata* Ell.

The binomial is erroneously credited to " E " = Elliott, and at the end of the short description is the synonym *" Prunus, umbellata "*. The date of the introduction of Eaton & Wright's volume is April, 1840, but this probably is not the date of publication. The Torrey & Gray transfer is entered in " Index Kewensis."

Chironia *stellaris Eaton, Man. ed. 2, 204. 1818 = *Sabatia stellaris* Pursh.

Probably *Chironia* † *stellata* Muhl., Cat. ed. 2, 23. 1818, *nomen nudum*, was intended, but no authority was cited. The entry for this in " Index Kewensis " is " Muhl. Cat. ex A. Gray, Syn. Fl. N. Am. ii. I. 115 [1878] " where Muhlenberg's binomial appears as a synonym of *Sabbatia* [*Sabatia*] *stellaris* Pursh. In all later editions of Eaton's work it appears as *S. stellaris* Pursh.

Chironia *venosa Muhl., Cat. 24. 1813, *nomen nudum*; ed. 2, 23. 1818, *nomen nudum*; Eaton, Man. 24. 1817 = ? *Sabatia lanceolata* (Walt.) T. & G.

All that Muhlenberg says regarding this species is that it occurred in New Jersey and in Tennessee, being " veiny-flowered " the corolla white. Eaton's description, more or less validating Muhlenberg's name is merely " stem somewhat decumbent, leaves lanceolate." It does not appear in the later editions of Eaton's work.

Chloris *secundus Eaton, Man. ed. 5, 173. 1829; ed. 6, 93. 1833; ed. 7, 241. 1836; ed. 8, 194. 1840 = *Bouteloua curtipendula* (Michx.) Torr.

The author is cited as " Ph." = Pursh, and in a footnote " Cynosurus, Ph." is listed; this is *Cynosurus secundus* Pursh (1814).

Chrysocoma *solidaginoides Eaton, Man. ed. 7, 242. 1836; ed. 8, 195. 1840 = *Chrysoma pauciflosculosa* (Michx.) Greene.

No synonym is cited, Eaton crediting the name to " N " = Nuttall. This would be *Chrysoma solidaginoides* Nutt. (1834) = *Solidago pauciflosculosa* Michx. (1803) = *Chrysoma pauciflosculosa* (Michx.) Greene.

***Chrysocopsis** Eaton, Man. ed. 7, 82. 1836 = *Chrysocoptis* Nutt. (1834).

On page 234, in a footnote from *Chrysocoptis*, the statement is made: " Erroneously spelled Chrysocopsis, at page 82; but better, as there spelled."

Citrus *limella Eaton & Wright, N. Am. Bot. 198. 1840, *sphalm.* = *C. limetta* Risso (1813).

Claytonia †spatulata Eaton, Man. ed. 2, 207. 1818; ed. 3, 240. 1822; ed. 4, 263. 1824 = *C. caroliniana* Michx.

The Index Kewensis entry is to edition four of Eaton's work. In edition five, p. 177, the footnote reference from *C. virginica* Linn. var. *latifolia* Torr. is: " C. caroliniana Mx. spathulaefolia, Ph. spatulata, 4th Ed."

Clematis *hexagona Eaton, Man. ed. 2, 208. 1818 = *Clematis verticillaris* DC. (*Atragene americana* Sims).

" A new species, which I found two miles west of Williams College." It was eliminated in all later editions, and from the short description can scarcely be other than a form of *C. verticillaris* DC.

Clematis *virginica Eaton, Man. ed. 2, 208. 1818; ed. 3, 241. 1822; ed. 4, 264. 1824; ed. 5, 177. 1829; ed. 6, 98. 1833; ed. 7, 247. 1836 = *C. virginiana* Linn.

This appears in edition one, 62. 1817, by error, as *C. virginana*. It appears under its correct name, *C. virginiana* Linn., in ed. 8, 199. 1840.

Cleome *erosa Eaton, Man. ed. 7, 249. 1836 = *Cristatella erosa* Nutt. = *C. jamesii* Nutt.

The authority is cited as " N " = Nuttall and the footnote reference is " Cristatell, N." = *Cristatella erosa* Nutt. This is apparently the same as *C. jamesii* Nutt. Eaton's hitherto unlisted binomial invalidates *Cleome erosa* Urb., Symb. Antill. **7**: 224. 1912, of Santo Domingo.

Cnicus *foliosus Eaton, Man. ed. 7, 250. 1836; ed. 8, 202. 1840.

Eaton credits the binomial to " H " = Hooker, but cites no synonym. Its basis was clearly *Carduus foliosus* Hook., Fl. Bor. Am. **1**: 303. 1833. The " Index Kewensis " entry is *Cnicus foliosus* A. Gray, in Proc. Am. Acad. **10**: 40. 1874.

Cnicus pitcheri Torr. ex Eaton, Man. ed. 5, 180. 1829; ed. 6, 101. 1833; ed. 7, 250. 1836; ed. 8, 202. 1840 = *Cirsium pitcheri* (Torr.) Torr. & Gray.

This is correctly entered in " Index Kewensis." *Carduus pitcheri* Steud., Nomencl. ed. 2, **1**: 284. 1840 is a synonym.

Cnicus *remotifolius Eaton, Man. ed. 7, 250. 1836; ed. 8, 202. 1840.

Eaton credits the authorship of the binomial to " H " = Hooker, but cites no synonym.

Its basis was clearly *Carduus remotifolius* Hook., Fl. Bor. Am. **1:** 302. 1833. The "Index Kewensis" entry is *Cnicus remotifolius* A. Gray, in Proc. Am. Acad. **10:** 47. 1874.

Cnicus *undulatus Eaton, Man. ed. 5, 180. 1829; ed. 6, 101. 1833; ed. 7, 250. 1836; ed. 8, 202. 1840 = *Cirsium undulatum* (Nutt.) Spreng.

Eaton credits the authority to "N" = Nuttall, but cites no synonyms. The basis was clearly *Carduus undulatus* Nutt. (1818). The "Index Kewensis" entry is *Cnicus undulatus* A. Gray, in Proc. Am. Acad. **10:** 42. 1874.

Cochlearia aquatica Eaton, Man. ed. 5, 181. 1829; ed. 6, 101. 1833; ed. 7, 251. 1836; ed. 8, 203. 1840 = *Rorippa aquatica* (Eaton) Palmer & Steyermark.

The "Index Kewensis" entry is correct. Eaton called this the water horseradish and recorded it from Pittsfield, Mass., and from the Oswego River, New York, stating that it was "manifestly indigenous; but perhaps a variety of armoracia." Synonyms are *Nasturtium lacustre* A. Gray, *Armoracia aquatica* Wiegand, *Neobeckia aquatica* Greene, *Radicula aquatica* B. L. Rob., and *Roripa americana* Britton.

Cochlearia *greenlandica Eaton & Wright, N. Am. Bot. 203. 1840, *sphalm.* = *C. groenlandica* Linn. = *C. officinalis* Linn.

Convallaria *umbellata Eaton, Man. ed. 5, 184. 1829; ed. 6, 104. 1833; ed. 7, 254. 1836; ed. 8, 205. 1840 = *Clintonia borealis* (Ait.) Torr.

Eaton credits the binomial to Michaux. It is *Convallaria umbellulata* Michx. = *Clintonia umbellulata* (Michx.) Torr.

Convolvulus *catesbeianus Eaton, Man. ed. 5, 186. 1829; ed. 6, 105. 1833 (*catesbyanus*); ed. 7, 256. 1836 (*catesbyanus*); ed. 8, 206. 1840 (*catesbyanus*) = ?

The authority is given as "Ph." = Pursh, no synonym cited. Its basis was clearly *Calystegia catesbeiana* Pursh, Fl. Am. Sept. **2:** 729. 1814, with type from Carolina.

Corallorhiza *hyemalis Eaton, Man. ed. 3, 250. 1822; ed. 4, 272. 1824; ed. 5, 186. 1829 = *Aplectrum hyemale* (Muhl.) Torr.

This was credited to "N" = Nuttall, and *Aplectrum hiemale* Nutt. is cited in the footnote. Nuttall, Gen. **2:** 197. 1818, proposed *Aplectrum* as a subgenus of *Corallorhiza*, with one species "3. *hiemalis. Cymbidium hiemale.*" This was *Cymbidium hyemale* Muhl. ex Willd. (1805).

Coronilla *omerus Eaton, Man. ed. 7, 260. 1836; ed. 8, 210. 1840, *sphalm.* = *C. emerus* Linn.

In edition five and six the entry is correct as *C. emerus* Linn.

Corydalis *rosea Eaton, Man. 79. 1817 = *C. sempervirens* (Linn.) Pers.

This name does not appear in other editions of Eaton's work. The very short description is: "1-spurred, leaves pinnate-pinnatifid, silique one and a half longer than peduncle. 4. r. [red] y. [yellow]." The name *C. rosea* Maxim. (1878), for an eastern Asiastic species, is invalidated by Eaton's earlier use of the same name.

Crataegus *platycarpa Eaton, Man. ed. 6, 112. 1833; ed. 7, 263. 1836 = *Crotalaria sagittalis* Linn.

What was intended here was *Crotalaria platycarpa* Link, Eaton's description, which is of a *Crotalaria,* not of a *Crataegus,* having been entered under the wrong generic name, an error readily explainable by Eaton's strictly alphabetic arrangement of the genera regardless of their botanical relationships.

Crotalaria *flexuosa Eaton, Man. ed. 6, 113. 1833; ed. 7, 264. 1836; ed. 8, 213. 1840 = *Crataegus *flexuosa* (Poir.) DC., Prodr. **2**: 627. 1825.

This strange entry was the one that first attracted the senior author's attention to nomenclatural problems posed by Eaton's work, through Rafinesque's having accepted *Crotalaria flexuosa* Eaton in his New Fl. N. Am. **2:** 56. 1836 [1837]. The description is clearly that of a

Crataegus, the entry having been erroneously placed under *Crotalaria.* Eaton's description is an exact translation of the Latin diagnosis of *Crataegus flexuosa* DC., but the errors do not end here; the entry in "Index Kewensis" is *Crataegus flexuosa* "Poir. Encyc. Suppl. IV. 73 = *tomentosa.*" It should be changed to *Crataegus *flexuosa* DC., Prodr. **2:** 627. 1825, for the original description was as *Mespilus flexuosa* Poir. in Lam., Encycl. Suppl. **4:** 73. 1816, correctly entered in "Index Kewensis." The type was a Bosc specimen from Carolina and the species has been strangely overlooked by all the specialists who have concerned themselves with a study of this difficult genus within the present century.

Cucubalus †douglassii Eaton, Man. ed. 6, 114. 1833; ed. 7, 266. 1836 = *Silene douglasii* Hook.

The authority is given as "H" = Hooker, and presumably the incomplete footnote reference "(4) Silene, Hk." belongs with this entry (there is no corresponding number in the text). In ed. 8, 427. 1840 it appears as *Silene douglasii* Hook. The "Index Kewensis" entry is to "Eaton, Man. ed. vii, ex ej. ed. viii, 427."

Cucubalus *nivens Eaton, Man. ed. 5, 192. 1829; ed. 6, 114. 1833; ed. 7, 266. 1836 = *Silene nivea* (Nutt.) Otth.

This was credited to "M" = Muhlenberg, no synonym cited. What was intended was *Cucubalus niveus* Nutt., Gen. **2:** 287. 1818 (*Silene nivea* Otth in DC., Prodr. **1:** 377. 1824) where in both cases the reference is to Muhlenberg's catalogue but without page references. Neither name appears in either edition of Muhlenberg's work, but on page 45 of both editions there is the entry *Silene alba* as a *nomen nudum.* Torrey & Gray, Fl. N. Am. **1:** 190. 1838, noted this, stating under *Silene nivea* Otth: "*Silene alba* (not, as Nuttall writes, *S. nivea*)."

Cyperus *aestuarius Torr. ex Eaton, Man. ed. 2, 227. 1818 = *C. filicinus* Vahl.

The description is ample and closes with the statement "discovered and described by Dr. John Torrey. Grows in salt marshes." C = Columbia College, i.e., the vicinity of New York City. It is certainly the species described by Torrey, as *Cyperus *caespitosus* Torr. Cat. Pl. City N. Y. 89. 1819, non Poir. "borders of salt marshes . . . on the banks of ditches in Hoboken meadows," which Torrey himself renamed *Cyperus nuttallii* Torr. in Am. Lyc. Nat. Hist. N. Y. **3:** 252. 1836 = *C. nuttallii* Eddy in Spreng., Neue Entd. **1:** 240. 1820 = *C. filicinus* Vahl (1806).

Cyperus †diandrus Torr. ex Eaton, Man. ed. 2, 226. 1818; Torr., Cat. Pl. City N. Y. 90. 1819.

The ample description in Eaton's work closes with this statement: "A new species, discovered by J. LeConte, Esq. on the borders of salt marshes." Torrey a year later says "Growing in salt marshes . . . in Hoboken." A valid species. The "Index Kewensis" entry is to Torrey's paper of 1819.

Cyperus *killingaeoides Eaton & Wright, N. Am. Bot. 217. 1840, *sphalm.* = *C. kyllingaeoides* sensu Pursh, Fl. Am. Sept. **1:** 50. 1814, non Vahl = *Cyperus filiculmis* Vahl, var. *macilentus* (Bicknell) Fernald.

The entry in editions five to seven of Eaton's work is as *C. kyllingaeoides,* in all, following Pursh, credited to Vahl; but Vahl's species is the very different South African *C. dubius* Rottb. (1773).

Dalea †ornata Eaton, Man. ed. 6, 120. 1833; ed. 7, 272. 1836; ed. 8, 219. 1840 = *Petalostemum ornatum* Dougl. ex Hook.

Eaton credits the name to Douglas, the footnote reference being to "Petalostemum Hk." that is, *Petalostemum ornatum* Dougl. ex Hook., Fl. Bor. Am. **1:** 138. 1830. The "Index Kewensis" reference is to "Eaton & Wright, N. Am. Bot. 219 [1840]."

Decumaria *alata Eaton, Man. ed. 6, 122. 1833; ed. 7, 275. 1836; ed. 8, 221. 1840, *sphalm.* = *Delesseria alata* Lamx. (Algae).

This is a curious error. The description is word for word the same as that of *Delesseria alata* Lamx. in edition five, p. 199. 1829. In the three last editions it was placed, by error, under the saxifragaceous genus *Decumaria*, although *Delesseria alata* also occurs in these three last editions.

***Deweya** Eaton, Man. ed. 6, 234. 1833; ed. 7, 403. 1836; ed. 8, 327. 1840 = *Nemopanthus* Raf. (1819).

Deweya *canadensis Eaton, ll.cc. = *Nemopanthus mucronatus* (Linn.) Trelease.

One suspects that here Eaton indicates his dislike of Rafinesque and for the type of botanical work that he sponsored. No botanist, however, has ever questioned the propriety of acceptance of *Nemopanthus* Raf. as a distinct genus. Eaton says: " The separation of this species from the genus Ilex, was suggested by Professor Dewey of Williams College, in 1818; and he wrote a generic description. I proposed publishing it in my 3d Ed, under the name *Deweya canadensis;* but M. Rafinesque was before me." The entry in Eaton's " Manual," ed. 3, 317. 1822 is in the form of a footnote from *Ilex canadensis* Michaux: " Nemophanthus fascicularis, R. This species certainly differs much in habit from the opaca, and perhaps it ought to form a new genus. Prof. Dewey of Williams college proposes the following description for a new genus, but does not propose any name. Cal. 0: petals 4, lanceolate, . . . " etc. These data are repeated in editions four and five, but it was not until 1833 that Eaton actually accepted Rafinesque's genus. Clearly *Ilex canadensis* Michx. was the source of Eaton's specific name, which, with its generic epithet, was presented only in synonymy.

Dioscorea †glauca Muhl., Cat. 92. 1813, *nomen nudum*; ed. 2, 97. 1818, *nomen nudum*; Eaton, Man. ed. 2, 233. 1818; ed. 3, 267. 1822; ed. 4, 287. 1824.

Eaton's brief description is the first validation of Muhlenberg's species which we have noted. The entry in Index Kewensis is to " Muhl. ex Beck, Bot. U. St. 355 [1833] " where the name appears only in synonymy. Bartlett in 1910 (in Bull. Bur. Pl. Ind. 189: 10, 13) recognized Muhlenberg's species as a valid one.

Dolichos *phaseolus Eaton, Man. 82. 1817 = *Phaseolus vulgaris* Linn.

The binomial does not appear in any of the later editions of Eaton's work. The very short description was " stem erect, seeds globular with coloured hilums," probably referring to one of the erect forms of the common garden bean.

Donia *pubescens Eaton, Man. ed. 7, 281. 1836; ed. 8, 227. 1840 = *Grindelia inuloides* Willd.

Eaton gives " N " = Nuttall as the authority but cites no synonym. The basis was unquestionably *Grindelia pubescens* Nutt. in Jour. Acad. Sci. Phila. 7: 74. 1834, which is a synonym of *G. inuloides* Willd. (1807).

Draba *unalaschiana Eaton, Man. ed. 7, 283. 1836; ed. 8, 228. 1840, *sphalm.* = *D. unalaschkiana* DC., Syst. 2: 350. 1821 = *D incana* sensu Hook., non Linn. = *D. borealis* DC.

***Eatonia** Drayton ex Eaton, Man. ed. 7, 528. 1836 = *Silene* Linn.

This appears in a footnote from *Silene baldwinii* Nutt. Dr. Charles Drayton of Charleston, South Carolina, proposed the generic name and Eaton actually published a part of his description. thus validating the name, although *Eatonia* Raf. (1819) = *Panicum* Linn. is much earlier. The descriptive note also appears in ed. 8, 428. 1840, but without a name, the author's name here indicated as Dr. S. Drayton. Eaton did not recognize the genus because, as he states, that he had " often committed himself in opposition to the separation of kindred species on account of a technical difference."

Eriophorum *virginatum Eaton & Wright, N. Am. Bot. 237, *sphalm.* = *E. vaginatum* Linn. vel *E. virginicum* Linn.

In editions three and four *E. virginicum* Linn. is admitted, but in five to seven *E. vaginatum* Linn.

Erysimum *amphibium Eaton, Man. ed. 5, 213. 1829; ed. 6, 139. 1833; ed. 7, 296. 1836 = *Rorippa amphibia* (Linn.) Besser.

The authority is erroneously credited to " W " = Willdenow, the footnote reference being to "*Nasturtium*, T." The basis of the name is clearly *Sisymbrium amphibium* Linn. *Nasturtium amphibium* R. Br. is a synonym.

Erysimum *nasturtium Eaton, Man. ed. 5, 213. 1829; ed. 6, 139. 1833; ed. 7, 295. 1836 = *Radicula nasturtium-aquaticum* Britton & Rendle = *Rorippa *nasturtium-aquaticum* (Linn.) Schinz & Thell., Fl. Schweiz, ed. 3, **1**: 240. 1909 = *Nasturtium officinale* R. Br.

Eaton erroneously credited this to Linnaeus, the footnote being *Nasturtium officinale* " T." = Torrey, but R. Brown first published that combination. The basic synonym is *Sisymbrium nasturtium-aquaticum* Linn. Eaton gave the common name as " english water-cress " thus clearly indicating that he had in mind the common and very widely distributed water-cress. Schinz & Thellung cite Beck as the author of the accepted binomial, but Beck apparently published it merely as *R. nasturtium*. According to an entry in Hegi, Ill. Fl. Mittel-Europa **4**(1): 319. 1918, sub *Nasturtium officinale* R. Br., von Hayek independently published the same transfer (*Rorippa nasturtium-aquaticum* (Linn.) von Hayek) but no reference is given, and we have not located his treatment of the name. *Nasturtium nasturtium-aquaticum* (Linn.) Karst. is the oldest name under *Nasturtium* but is especially excluded under illustrations in Article 68 of the International rules.

Erysimum *palustre Eaton, Man. ed. 5, 213. 1829; ed. 6, 139. 1833; ed. 7, 295. 1836 = *Radicula palustris* Moench = *Rorippa palustris* (Linn.) Besser = *R. *islandica* (Oder ex Murr.) Borbás, Balaton Növényföldrajza 392. 1900; Schinz & Thell., Fl. Schweiz ed. 3, **1**: 240. 1909.

Eaton erroneously indicated the authority as Linnaeus, the footnote reference being " terrestre, s. Nasturtium, T." The basis of the specific name was *Sisymbrium amphibium* Linn. var. *palustre* Linn. *Nasturtium palustre* DC. is a synonym. For critical notes on the accepted name *Rorippa islandica* (Oder ex Murr.) Borbás, see Butters and Abbe in Rhodora **42**: 25, 1940 (footnote), and Fernald, op. cit. **30**: 132. 1928, **31**: 17-18. 1929.

Erysimum *vulgare Eaton, Man. ed. 5, 213. 1829; ed. 6, 139. 1833; ed. 7, 296. 1836 = *Rorippa sylvestris* (Linn.) Besser.

The authority is erroneously indicated as " P " = Persoon, no synonym cited. The basis of Eaton's name was clearly *Sisymbrium vulgare* Pers., which in turn was a new name for *S. sylvestre* Linn. *Nasturtium sylvestre* R. Br. and *Radicula sylvestris* Druce are synonyms.

Erysimum *walteri Eaton, Man. ed. 5, 213. 1829; ed. 6, 139. 1833; ed. 7, 286. 1836 = *Rorippa walteri* (Ell.) Mohr.[8]

The authority is erroneously given as " E " = Elliott, no synonym being cited. The basis of the name was clearly *Sisymbrium walteri* Ell., Sketch. **2**: 146. 1822, which in turn was a new name for *E. tanacetaefolium* sensu Walter, non Linn. *Radicula walteri* Small is a synonym.

Esula *corollata Eaton, Man. ed. 2, 242. 1818 = *Euphorbia corollata* Linn.

No authority or synonymy is cited, but Eaton states that he took his species of *Esula* out of *Euphorbia*: " See Persoon. This division is very proper. Every one has observed the unnatural union of the spotted spurge and the garden caper."

Esula *lathyrus Eaton, Man. ed. 2, 242. 1818 = *Euphorbia lathyrus* Linn.

Similar to the preceding case.

Esula *mercurialina Eaton, Man. ed. 2, 242. 1818 = *Euphorbia mecurialina* Michx.

Similar to the preceding cases.

Eupatorium *gracile Torr. ex Eaton, Man. ed. 2, 244. 1818, non H.B.K. (1820), nec D. Don (1835). Ex descr. = *Eupatorium altissimum* Linn.

---

[8] See Appendix A.

No authority is cited and no locality is given, but at the end of the description is the statement: "A new species by Dr. John Torrey." Apparently Torrey withdrew this species, for we find no reference to it elsewhere. His material was certainly from the vicinity of New York City. Under the homonym rule the name for a South American species, *E. gracile* H.B.K. (1820), non Torr. (1818), should be changed.

Eupatorium †laevigatum Torr. ex Eaton, Man. ed. 2, 245. 1818; ed. 3, 278. 1822; ed. 4, 296. 1824; Torr., Cat. Pl. City N. Y. 64. 92. 1819, non Lam. = *Eupatorium †fistulosum* Barratt, Eupat. Verticil. No. 1. 1841; Wood, Class-Book, ed. 2, 314. 1847.

Eaton says: "A new species by Dr. John Torrey" and actually published an English description of it one year before Torrey published his own Latin diagnosis. For the reduction of this to Barratt's obscurely published species see Wiegand & Weatherby, in Rhodora **39:** 306. 1937. Torrey and Gray, Fl. N. Am. **2:** 82. 1841, placed it as a synonym of *Eupatorium purpureum* Linn. var. *angustifolium* Torr. & Gray. Torrey's specimen was from a cedar swamp at New Durham, neighborhood of New York City.

Evolvulus *nummularis Eaton, Man. ed. 5, 217. 1829; ed. 6, 145. 1833; ed. 7, 302. 1836; ed. 8, 244. 1840, *sphalm.* = *E. nummularius* Linn.

Fedia †coerulea Aikin ex Eaton, Man. ed. 7, 578. 1836; ed. 8, 469. 1840 = *Valerianella locusta* (Linn.) Bettke.

This name appears in a footnote from *Valerianella coerulea* Eaton as "Fedia coerula, MSS. of Aikin." His specimen was from Maryland. The Index Kewensis entry is "*caerulea*, Aikin, ex Eaton & Wright, N. Am. Bot. 469 [1840]."

Fluvialis *fragilis Eaton, Man. 100. 1817; ed. 2, 248. 1818 = *Najas guadalupensis* (Spreng.) Morong.

No authority or synonymy is given but what Eaton had in mind was clearly *Caulinia fragilis* sensu Pursh (1814), non Willd., for his short description is an exact translation of Pursh's diagnosis. This we judge to be the same as *Najas guadalupensis* (Spreng.) Morong, Sprengel's original description having been published in 1825. *N. microdon* A. Braun (1868) is a synonym. Eaton's specific name is invalid in *Najas*.

Fuirena *squamosa Eaton, Man. ed. 3, 284. 1822, *sphalm.* = *F. squarrosa* Michx.

The entries in editions four to eight of Eaton's work are correct, *Fuirena squarrosa* Michx., and the above error was corrected on page 522 of edition three.

Galactia †villosa Eaton, Man. ed. 6, 150. 1833; ed. 7, 308. 1836; ed. 8, 248. 1840 = *Tephrosia spicata* (Walt.) Torr. & Gray.

Eaton cites the authority as "N" = Nuttall, and gives no synonym. Clearly what he had in mind was *Tephrosia prostrata* Nutt. which had been published as a new name for *T. villosa* Michx. (1805), non Pers. (1807). The entry in "Index Kewensis" is to "Eaton & Wright, N. Am. Bot. 248. [1840]."

Galega †paucifolia Eaton, Man. ed. 5, 223. 1829; ed. 6, 151. 1833 = *Tephrosia spicata* (Walt.) Torr. & Gray.

The authority is given as "N" = Nuttall and the footnote reference is to "villosa, Mx. spicata, Wr. [= Walter]." *Tephrosia paucifolia* Nutt. was unquestionably the source of Eaton's specific name. The entry in Index Kewensis is M. A. Curtis in Bost. Jour. Nat. Hist. **1:** 122. 1837, but Eaton antedated Curtis by eight years.

Gaultheria hispidula Muhl., Cat. 44. 1813, *nomen nudum*; ed. 2, 44. 1819, *nomen nudum*; Eaton, Man. ed. 2, 255. 1818 = *Chiogenes hispidula* (Linn.) Torr. & Gray.

No authority is actually indicated in edition two of Eaton's work, but the name, with description, appears in all succeeding editions, with the synonyms given in a footnote as "serpillifolia, Ph. Vaccinium hispidulum, L. Oxycoccus hispidulus, P. Arbutus thymifolius, A. filiformis, Lk." The basis of Muhlenberg's name was probably *Vaccinium hispidulum* Linn. The "Index Kewensis" entry is correct as to Muhlenberg's strictly *nomen nudum* which Eaton validated by first providing a brief description, and later adding various synonyms.

Glechoma *cordata Eaton, Man. ed. 2, 259. 1818; ed. 3, 292. 1822; ed. 4, 309. 1824 = *Glechoma hederacea* Linn. (*Nepeta glechoma* Benth.).

In edition three, Eaton credits the authority to "M" = Muhlenberg, but Muhlenberg published no such binomial but rather *Glechoma *cordifolia* Muhl., Cat. 55. 1813. In editions five to eight of Eaton's work the entry appears as *Glechoma hederacea* Linn. var. *cordata* Eaton.

Glycine *helvata Eaton, Man. ed. 3, 292. 1822; ed. 4, 309. 1824, *sphalm.* = *Phaseolus helvola* Linn. = *Strophostyles helvola* (Linn.) Ell.

Eaton cites the authority as "E" = Elliott who published it as *Glycine helvola* Ell. in Jour. Acad. Nat. Sci. Phila. **1:** 326. 1818, and in his Sketch **2:** 230. 1822 as *Strophostyles helvola* Ell., its basis being *Phaseolus helvolus* Linn. as described by Willdenow. Eaton's footnote reference is "Phaseolus helvolus, W."

Gordonia *franklinia Eaton, Man. 78. 1817 = *G. franklinii* L'Hérit. = *Franklinia alatamaha* Bartr. ex Marsh. (*Gordonia alatamaha* Sargent).

Gratiola *pubescens Torr. ex. Eaton, Man. ed. 2, 262. 1818, non R. Br. (1810) = *Gratiola neglecta* Torr.

Eaton notes that this grew in wet places near New York City and that it was discovered and described by Dr. John Torrey. It is clearly the species actually described one year later as *Gratiola neglecta* Torr., Cat. Pl. City N. Y. 10, 89. 1819. For full synonymy and range see Pennell, in Acad. Nat. Sci. Phila. Monog. **1:** 84-92. 1935.

Gymnandra *bullii Eaton in Eaton & Wright, N. Am. Bot. 259. 1840 = *Besseya bullii* (Eaton) Rydb. in Bull. Torr. Bot. Club **30**: 280. 1903.

Eaton's type was from Michigan. The species is a universally accepted one extending from Michigan and Minnesota to Ohio and Iowa. Synonyms are *Wulfenia bullii* Barnh. and *Synthyris bullii* Heller.

Habenaria *fuscescens Torr., Compend. Fl. N. Mid. States 318. 1826; Eaton, Man. ed. 5, 234. 1829; ed. 6, 163. 1833; ed. 7, 322. 1836; ed. 8, 260. 1840 = *Habenaria flava* (Linn.) R. Br.

Torrey cites no name-bringing synonym, but this unquestionably was *Orchis fuscescens* Pursh (1814). Eaton erroneously indicates the authority as "W." = Willdenow and also cited no synonym.

Habenaria *quinqueseta (Michx.) Eaton, Man. ed. 5, 253. 1829; ed. 6, 164. 1833; ed. 7, 323. 1836; ed. 8, 260. 1840; Swartz, Adnot. Bot. 46. 1829.[9]

Both Eaton and Swartz published the transfer in the same year but the evidence is that Eaton's treatment antedates that of Swartz; neither is listed in Index Kewensis. The introductory part of edition five of Eaton's Manual is dated Jan. 12. 1829, as is the registration of title notice; the preface to Swartz' work is dated May 25, 1829. Eaton erroneously cited the authority as Michaux, the footnote synonymy being "michauxii, N. Orchis, Mx." Its basis was *Orchis quinqueseta* Michx. *Habenaria michauxii* Nutt. and *H. simpsonii* Small are synonyms.

---

[9] The location of this unlisted but not overlooked Swartzian transfer caused us to scan the other entries in Swartz' posthumous work of 1829. Validly published but as yet unlisted new binomials appearing in this work are: *Digitaria *vulgaris* Sw. p. 16 (West Indies and tropical Africa); *Hoffmannia *verticillata* and *H. *obovata* Sw., both p. 19; *Melastoma *guadalupense* Sw., p. 29 (Guadalupe); *Habenaria *japonica* Sw. (*Orchis japonica* Thunb.), *H. *koenigii* Sw. (*Orchis koenigii* Retz.), *H. *psychodes* Sw. (*Orchis psychodes* Linn.), all on p. 45; *H. *foliosa* Sw. (*Orchis foliosa* Sw.) and *H. *humilis* Sw. (*Orchis humilis* Michx.), both on p. 46; *Bonatea *ichnumonea* Sw. (*Orchis ichnumonea* Afzel.), *B. *procera* Sw. (*Orchis procera* Afzel.). *B. *membranacea* Sw. (*Orchis membranacea* Afzel.), all on p. 48; *Arethusa *reflexa* Sw. (*Serapias reflexa* Pers., *Epipactis reflexa* Labill.), p. 51; *Dendrobium *grandiflorum* Sw. (*Epidendrum grandiflorum* Humb. & Bonpl.), p. 54; *Cymbidium *antenniferum* Sw. (*Epidendrum antenniferum* Humb. & Bonpl.), p. 57, and *C. *monanthos* Sw. (*Arethusa plicata* Andr.), p. 58.

Hedysarum †aikinii Eaton, Man. ed. 5, 236. 1829; ed. 6, 166. 1833; ed. 7, 325. 1836; ed. 8, 262. 1840 = *Desmodium canescens* (Linn.) DC.

This was proposed as a new name for *Hedysarum viridiflorum* sensu Pursh, non Linn. The "Index Kewensis" entry is to edition six of Eaton's "Manual."

Helianthus *ballii Eaton, Man. ed. 7, 329. 1836; ed. 8, 265. 1840.

The description was based on a specimen from the west, indicated as "R" which meant the Rocky Mountain region. It was dedicated to the British traveller, John Ball. We have not been able to place the species satisfactorily from the short description alone.

Helianthus *decapetalus Linn., Sp. Pl. 905. 1753.

The entry in Index Kewensis is, by error, "decapitatus, Linn. Sp. Pl. 905" our attention being called to this through checking the entries in all editions of Eaton's "Manual" and finding the *Helianthus decapetalus* Darlington entry of 1826 in Index Kewensis distinctly later than Eaton's first and correct use of the name.

Helleborus *trifoliatus Eaton, Man. 62. 1817 = *H. trifolius* Linn. = *Coptis trifolia* Salisb., *quoad nomen* = *C. groenlandica* (Oeder) Fernald, *quoad descr.*

For a discussion of the proper name for the North American form see Fernald, in Rhodora **31**: 142. 1929.

Hemianthus *micranthus Eaton, Man. ed. 5, 241. 1829; ed. 6, 171. 1833; ed. 7, 332. 1836; ed. 8, 267. 1840 = *Lindernia dubia* (Linn.) Pennell, subsp. *major* Pennell, var. *inundata* Pennell.

The authority is indicated as "Ph." = Pursh, and the footnote reference is "micranthemoides, N. Herpestis Ph." Its basis is hence *Herpestis micrantha* Pursh (1814); thus Eaton's transfer antedates that of Pennell, Torreya **19**: 150. 1919. However, the form that Pursh described proves to be a *Lindernia;* see Pennell in Acad. Nat. Sci. Phila. Monog. **1**: 151. 1935.

Herpestis *brownei Nutt., Gen. N. Am. Pl. **2**: 42, 1818; Steud., Nom. Phan. 402, 1821; Eaton, Man. ed. 5, 242. 1829; ed 6, 172. 1833; ed. 7, 333. 1836; ed. 8, 268. 1848 = *Bacopa monnieri* (Linn.) Pennell.

Eaton credits the name to "Ph." = Pursh, citing no synonym; apparently "P" = Pers. was intended for the name involved was *Monniera brownei* Pers., Syn. **2**: 166. 1807, proposed as a new name for *Gratiola monnieri* Linn.

Heteranthera *ovalis Eaton, Man. ed. 5, 242. 1829; ed. 6, 173. 1833; ed. 7, 333. 1836; ed. 8, 268. 1840 = *Heteranthera limosa* (Sw.) Willd.

The name was credited to Michaux, the footnote reference being "limosa, Vahl. Leptanthus, Mx."; Eaton's specific name is thus derived from *Leptanthus ovalis* Michx.

Hydrocharis *spongiosa Eaton, Man. ed. 5, 248. 1829; ed. 6, 179. 1833; ed. 7, 342. 1836; ed. 8, 277. 1840 = *Hydrocharis spongia* Bosc (1807).

Bosc is erroneously cited as the authority for this new name, the footnote reference being "[Hydrocharis] cordifolia, N." = Nuttall. Clearly *H. spongia* Bosc was intended.

Hydrocotyle †bulbosa Eaton, Man. ed. 7, 342. 1836; ed. 8, 277. 1840 = *Erigenia bulbosa* Nutt.

The binomial was credited to "N" = Nuttall, the species being placed under the subgenus *Erigenia;* Nuttall published this as a genus in 1818. The "Index Kewensis" entry is to "Eaton & Wright, N. Am. Bot. 277 [1840]."

Ilex *dakoon Eaton, Man. ed. 6, 186. 1833; ed. 7, 349. 1836; ed. 8, 282. 1840, *sphalm.* = *I. dahoon* Walt. = *I. cassine* Linn.

Ionidium *concolor Eaton, Man. ed. 256. 1829; ed. 6, 188. 1833; ed. 7, 351. 1836; ed. 8, 283. 1840 = *Hybanthus concolor* (Forst.) Spreng. (*Cubelium concolor* Raf.).

The authority is erroneously cited as Forster, the footnote reference being " viola, Fost, Ph. &c.", the name-bringing synonym thus being *Viola concolor* Forst. The "Index Kewensis" entry for *I. concolor* is " Benth. & Hook.f. ex S. Wats. Bibliog. Ind. N. Am. Bot. 81 [1878]."

Isnardia †ascendens Hall ex Eaton, Man. ed. 7, 353. 1836; ed. 8, 285. 1840 = *Rotala ramosior* (Linn.) Koehne.

The author of this was James Hall, an associate of Amos Eaton, and the type from the vicinity of Albany, New York. The entry in " Index Kewensis " is " Hall, ex Eaton & Wright, Man. ed. VIII. 283. [1840]." See Svenson, in Torreya **35:** 122. 1935, for a note on the probable identity of Hall's species.

Juglans *squarrosa Eaton, Man. ed. 2, 288. 1818, *sphalm.* = *J. squamosa* Michx. = *Carya ovata* (Mill.) K. Koch.

Krigia *griffithii Eaton, Man. ed. 7, 360. 1836; ed. 8, 290. 1840 = *Cynthia virginica* (Linn.) D. Don.

Authorship of the binomial is erroneously credited to " N " = Nuttall, the footnote reference being to " Cynthia "; this would be *Cynthia griffithii* Nutt. (1824).

Krigia *lyrata Eaton, Man. ed. 7, 360. 1836; ed. 8, 291. 1840 = *Cynthia dandelion* (Linn.) DC.

Erroneously credited to " N " =Nuttall, the footnote reference being merely " Cynthia "; this would be *Cynthia lyrata* Nutt. (1834).

Lathyrus albidus Aikin ex Eaton, Man. ed. 6, 198. 1833; ed. 7, 362. 1836 = *L. ochroleucus* Hook. (1833).

No locality is indicated, but as Aikin was associated with Eaton in the preparation of the copy for edition six of the " Manual " it may be assumed that the specimen came from the vicinity of Albany, New York. In edition seven it was placed in the vicinity of *Lathyrus ochroleucus* Hook., which Eaton then accepted, but in edition eight the latter was retained and *L. albidus* Aikin was eliminated. The " Index Kewensis " entry is correct.

Lathyrus †stipulaceus Le Conte ex Eaton, Man. ed. 2, 294. 1818; ed. 7, 362. 1836; Le Conte ex Torr., Cat. Pl. City N. Y. 60. 92. 1819 = *Lathyrus palustris* Linn.

At the end of the description Eaton states " Torrey. A new species, discovered by J. Le Conte, Esq." Le Conte's specimen was from Greenwich [Connecticut] and Torrey published the species one year later than did Eaton. It appears in only two of the eight editions of Eaton's " Manual," for some unexplained reason being reinstated in edition seven.

Laurus *albida Eaton, Man. ed. 5, 269. 1829; ed. 6, 199. 1833; ed. 7, 364. 1836; ed. 8, 294 1840 = *Sassafras albidum* (Nutt.) Nees.

The authority is indicated as " N " = Nuttall who actually published it as *Euosmus albida* Nutt., Gen. 1:259. 1818. *Euosmus* was characterized by Nuttall as a subgenus of *Laurus* Linn., but he published eight binomials under it rather than under *Laurus*. This Eaton name replaces the " Index Kewensis " entry *Laurus* " albida Loud. ex Meissn. in DC. Prodr. xv. I. 513, 516 [1864]."

Laurus *camphorata Eaton, Man. ed. 2, 295. 1818; ed. 3, 328. 1822; ed. 4, 340. 1824; ed. 5, 269. 1829, all as *camphoratus* = *Cinnamomum camphora* (Linn.) Nees & Eberm.

This was indicated as from Japan. What Eaton had in mind was the camphor tree, *Laurus camphora* Linn., as it appears in the later editions of his work. *L. camphorata* Buch.-Ham. (1831) is a totally different species.

Lavandula *spicata Eaton, Man. 65. 1817 = *L. vera* DC.

This entry was apparently an inadvertent one, *L. spica* Loisel. being intended. It was corrected to *L. spica* in all later editions, in some of these the authority being erroneously stated as Willdenow.

Leiophyllum *thymifolium Eaton, Man. ed. 2, 298. 1818; ed. 3, 332. 1822; ed. 4, 344. 1824 = *L. buxifolium* (Berg.) Ell. (*Dendrium buxifolium* Desv.)

The authority is erroneously given as " P " = Persoon, but *Ledum thymifolium* Lam. was clearly the source of the specific name, the footnote reference being " buxifolium, A. Amyrsine buxifolia, Ph. Ledum thymifolium, Lk." The " Index Kewensis " entry is to Steudel, Nomencl. ed. 1, 469. 1821.

Leptopoda *fimbriata Eaton, Man. ed. 5, 275. 1829; ed. 6, 202. 1833; ed. 7, 367. 1836; ed. 8, 297. 1840 = *Helenium vernale* Walt.

Eaton erroneously credited the authority to Willdenow, but in a footnote indicated the synonymy as " puberula, Macbride, Galardia Mx.", the name-bringing synonym thus being *Galardia fimbriata* Michx., Fl. Bor. Am. 2: 142. 1803. The *Leptopoda fimbriata* Torr. & Gray, N. Am. Fl. 2: 387. 1842, description, as entered in Index Kewensis, was based on Texan material probably representing a species distinct from the one Michaux described.

Limnetis *glomerata Eaton, Man. 14. 1817 = *Dactylis glomerata* Linn.

The generic entry is " Limnetis, or Dactylis " and at the end of the description is the entry " *glomerata,* (orchard grass) " with its very brief description. We believe that this entry can be interpreted only as a new combination under *Limnetis,* even if this was a serious error on the part of the then inexperienced botanical author. Rafinesque in his review of Eaton's Manual in Am. Monthly Mag. Crit. Rev. **1:** 429. 1817, noted this strange procedure, stating: " He has two genera with double names! which is an unaccountable blunder, viz. *Limnetis* or *Dactylis!* and *Bartonia* or *Centaurella!* In the first instance, *Dactylis* is the real name, *Limnetis* being of a different genus." = *Spartina* Schreber.

Lonicera hirsuta Eaton, Man. ed. 2, 307. 1818; ed. 3, 341. 1822; ed. 4, 352. 1824; ed. 5, 282. 1829; ed. 6, 210. 1833; ed. 7, 376. 1836; ed. 8, 304. 1840.

A valid species extending from western New England to Pennsylvania, Michigan and Manitoba, the type from near Williamstown, Mass. This specimen, the locality not indicated, is in Eaton's herbarium at Yale University. The " Index Kewensis " entry is correct.

Lysimachia *thyrsifolia Eaton, Man. 22. 1817, *sphalm.* = *L. thyrsiflora* Linn. (*Naumbergia thyrsiflora* Duby).

The error was detected by Eaton and was corrected in the later editions of his work.

Macrotys *cordifolia Eaton, Man. ed. 5, 288. 1829 = *Cimicifuga americana* Michx.

The authority is erroneously given as Pursh, the footnote being " Actea, Dc. Cimicifuga, E."; this would be *Cimicifuga cordifolia* Pursh which is a synonym of the earlier *C. americana* Michx.

Macrotys *foetida Eaton, Man. ed. 5, 288. 1829; ed. 6, 218. 1833; ed. 7, 285. 1836; ed. 8, 311. 1840 = *Cimicifuga foetida* Linn.

The authority is erroneously given as Willdenow, no synonyms cited, the range indicated as " W " = Western North America. The name-bringing synonym would be *Cimicifuga foetida* Linn., a Eurasian not an American species; but the basis of the description was probably *Cimicifuga foetida* sensu Pursh, Fl. Am. Sept. **2:** 373. 1814 (from the north western United States), non Linn. = *C. elata* Nutt. The entries in editions six to eight are as *Macrotrys foetida.*

Macrotys *palmata Eaton, Man. ed. 5, 288. 1829 = *Trautvetteria carolinensis* (Walt.) Vail.

The authority is erroneously indicated as Michaux, the footnote reference being " Actea, Dc. Cimicifuga, E." The name-bringing synonym would be *Cimicifuga palmata* Michx., Fl. Bor. Am. 1: 316. 1803, which is the same as *Hydrastis carolinensis* Walt. = *Trautvetteria carolinensis* Vail.

Macrotys *podocarpa Eaton, Man. ed. 5, 288. 1829 = *Cimicifuga racemosa* (Linn.) Nutt.

The authority is erroneously indicated as de Candolle, the footnote reference being "Cimicifuga serpentaria Ph. Actaea, L.". Eaton took his specific name from *Cimicifuga podocarpa* DC.

Macrotys *racemosa Eaton, Man. ed. 5, 288. 1829 = *Cimicifuga racemosa* (Linn.) Nutt.

No authority is indicated, the footnote reference being "Cimicifuga serpentaria, Ph. Actaea, L."

Macrotys *serpentaria Eaton, Man. ed. 3, 347. 1822; ed. 4, 356. 1824 = *Cimicifuga racemosa* (Linn.) Nutt.

No authority is indicated. The footnote reference is "Cimicifuga serpentara, Ph. racemosa, N. Actaea L.". The name-bringing synonym would be *Cimicifuga serpentaria* Pursh, Fl. Am. Sept. **2:** 372. 1814.

Melia *triflora Eaton, Man. ed. 2, 317. 1818 = *Trisetum spicatum* (Linn.) Richt.

The description is of a grass from the "Whitehills" = White Mountains of New Hampshire: "A new species discovered by Dr. Bigelow." This is *Melica triflora* Bigelow, the entry being erroneously entered under *Melia* which immediately precedes *Melica* in Eaton's work. The error was corrected in editions three and four, after which the species was dropped.

Micropetalon *longifolium Eaton, Man. ed. 5, 295. 1829; ed. 6, 225. 1833; ed. 7, 394. 1836; ed. 8. 319. 1840 (as *Micropetalum*) = *Stellaria longifolia* Muhl.

Eaton cited the authority as "M" = Muhlenberg, giving a footnote reference to "gramineum, Ph. Stellaria, M.", the specific name thus being taken from *Stellaria longifolia* Muhl. ex Willd., Enum. Hort. Berol. 479. 1809. This is a valid species, *Alsine longifolia* Britton being a synonym.

†Microstylis (Nutt.) Eaton, Man. ed. 4, 362. 1824; ed. 5, 295. 1829; ed. 6, 226. 1833; ed. 7, 394. 1836; ed. 8, 319. 1840 = *Malaxis* Soland. ex Sw. (1778).

Like many problems in nomenclature, to record this is suggestive of the proverbial saying "to strain at a gnat and swallow a camel." At most only the authority for the generic name is involved. In general Nuttall is indicated as the author of the generic name *Microstylis*, but in his Genera **2:** 196. 1818 he clearly published it as a subgenus of *Malaxis;* and the third species of the latter genus, placed under *Microstylis,* was published as *Malaxis ophioglossoides,* not as *Microstylis ophioglossoides* Nutt. as listed. Ames, Enum. Orch. U. S. 116. 1924, cites it as *Microstylis* (Nutt.) Lindl., but we find no record of a treatment by Lindley anterior to 1826; Robinson and Fernald in Gray's Manual, ed. 7, 318. 1907 correctly cite it as *Microstylis* (Nutt.) Eaton.

Mimosa *brachyloba Eaton, Man. 77. 1817 = *Desmanthus brachylobus* Benth. = *D. illinoensis* Michx.) MacM.

The key to this entry is found in Eaton's Manual, ed. 5, 89, 1829, where it appears as *Acacia brachyloba* Willd., with a footnote reference to *Mimosa illinoensis* Michx. The entry in "Index Kewensis" is Mimosa "brachyloba Muhl. ex Steud. Nom. ed. II. ii. 147" [1841]. Muhlenberg, Cat. 96. 1813, lists it merely as *Acacia brachyloba.*

Monarda beckii Eaton, Man. ed. 5, 298. 1829; ed. 6, 229. 1833; ed. 7, 398. 1836; ed. 8, 322. 1840 = *Blephilia hirsuta* (Pursh) Benth. vel *B. ciliata* (Linn.) Raf.

This is correctly entered in "Index Kewensis" Suppl. 8, the original entry being to edition six. It was based on material collected by L. C. Beck near St. Louis as having been described by Dr. Torrey in the Annals of the N. Y. Lyceum of Natural History. In that periodical **2:**

233. 1827, this was apparently *Monarda ciliata* Pursh " var. β? " for at the end of the description is a statement " Dr. L. C. Beck seems to have found the same plant near St. Louis on the Missouri, and supposes it may be a new species." *Blephilia becki* Raf. (1832) was actually based on Torrey's description and is hence the same as *Monarda beckii* Eaton.

Monarda *pilosa Torr. ex Eaton, Man. ed. 2, 323. 1818 = *Blephilia ciliata* (Linn.) Raf.

The brief description closes with the statement: " Torrey, A new species discovered by Mr. Le Conte." The locality " C " = Columbia College, i.e., vicinity of New York City. Apparently Torrey discovered that his species was not a new one and withdrew it, for we have found no other consideration of it.

Monotropa *europea Eaton & Wright, N. Am. Bot. 323. 1840 = *Monotropa hypopithys* Linn. (*Hypopithys lanuginosa* Raf., *H. americana* Small).

The brief description closes with the statement: " Hypopithys europea of the 7th edition," this being erroneously credited to " N " = Nuttall, Gen. **1**: 271. 1818, the footnote reference being to " hypopithys, L.".

Monotropa *procera Torr. ex Eaton, Man. ed. 2, 324. 1818 = *Pterospora andromedea* Nutt. 1818).

" Found at Greenbush, by Mr. Edwin James; named and described by Dr. John Torrey." This is cited as a synonym of *Pterospora andromedea* Nutt. (1818) by Britton & Brown, Ill. Fl. North. U. S. ed. 2, **2**: 673. 1913, and the statement is there made that while the two works involved were both printed in 1818, Nuttall's Genera appeared earlier than this edition of Eaton's Manual.

Myrrhis *dulcis Eaton, Man. ed. 2, 326. 1818 = *Osmorhiza claytoni* (Michx.) C. B. Clarke.

The origin of the name is not indicated, but in edition three, p. 498, *Uraspermum claytoni* replaces it and the footnote states " Myrrhis dulcis, 2nd. ed. Scandix dulcis, M. Scandix claytoni, Mx. (see N.) Chaerophyllum claytoni, Ph." Thus *Scandix dulcis* Muhl., Cat. 31. 1813, was published as a new name for *Myrrhis* [*Claytoni*], Michx. and is the source of Eaton's specific name. *Myrrhis *dulcis* Raf., Good Book 53. 1840, in syn., was probably also taken from Muhlenberg.

Nyssa *triflora Eaton, Man. 116. 1817 = *N. sylvatica* Marsh. var. *biflora* (Walt.) Sarg.

The description is " (sour gum) leaves oval, peduncle about 3-flowered." Certainly only a minor variant of *Nyssa biflora* Walt.

Oenanthe *longifolia Eaton, Man. ed. 5, 305. 1829; ed. 6, 237. 1833 = *Oxypolis rigidior* (Linn.) Raf.

The authority is erroneously indicated as Pursh, the footnote reference being to " Pastinaca, T. Sium, Ph.", the name-bringing synonym thus being *Sium longifolium* Pursh.

Oenothera *longifolia Eaton & Wright, N. Am. Bot. 332. 1840 = ? *O. longiflora* Linn.

No authority is given, and no synonyms are cited. The species is indicated as " exotic ". It is suspected that this was a typographical error, *O. longiflora* Linn. being intended.

Panicum †angustifolium Le Conte ex Eaton, Man. ed. 2, 342. 1818; ed. 3, 374. 1822; ed. 4, 380. 1824; Le Conte ex Torr., Cat. Pl. City N. Y. 18, 91. 1819, non Ell. (1816) = *Panicum dichotomum* Linn.

Le Conte's specimen was from the Newark meadows in New Jersey. Eaton's slightly earlier place of publication was noted by Hitchcock in 1935. All that Eaton says, following the short description, was: " Le Conte. A new species." Beginning with edition five of the Manual *Panicum angustifolium* Le Conte was dropped, and the different *P. angustifolium* Ell. was accepted.

Panicum *barbatum Le Conte ex Eaton, Man. ed. 2, 342. 1818; ed. 3, 374. 1822: ed. 4, 380. 1824, non Lam. (1791) = ? *Panicum mattamuskeetense* Ashe.

At the end of the short description Eaton states: "Le Conte. A new species." The specimen was undoubtedly from the vicinity of New York City, and Le Conte (or Torrey) apparently abandoned the species, although Torrey in 1824 treated it as *Panicum nitidum* Lam. var. *barbatum* Torr. The suggested reduction is that of Hitchcock in 1935.

Panicum †macrocarpon Le Conte ex Eaton, Man. ed. 2, 341. 1818; ed. 3, 374. 1822; ed. 4, 380. 1824; ed. 5, 313. 1829; ed. 6, 247. 1833; ed. 7, 419. 1836; ed. 8, 340. 1840; Le Conte ex Torr. Cat. Pl. City N. Y. 17. 91. 1819 = *Panicum latifolium* Linn.

This record is merely a reference to a slightly earlier place of publication than that currently indicated, although Hitchcock in 1935 had noted this Eaton treatment. Following the description Eaton merely says "Le Conte"; Torrey says: "In moist shady situations," and the locality would be in or near New York City.

Panicum †umbrosum Le Conte ex Eaton, Man. ed. 2, 342. 1818; ed. 3, 372. 1822; ed. 4, 380. 1824; Le Conte ex Torr., Cat. Pl. City N. Y. 18. 91. 1819, non Retz. (1786) = *Panicum ashei* Pearson.

Another slight change in the place and time of publication, also noted by Hitchcock in 1935. Le Conte's specimen was from Bloomingdale, Manhattan Island, New York City.

Phaca *latiflora Eaton & Wright, N. Am. Bot. 349. 1840, *sphalm.* = *Phaca lotiflora* (Hook.) Nutt. (*Batophaca lotiflora* Rydb.).

The binomial is credited to Hooker, no synonym being cited. Its origin is clearly *A[stragalus]? (an Phaca?) lotiflorus* Hook., Fl. Bor. Am. **1:** 152. 1834.

Phaca †triphylla Eaton, Man. ed. 5, 325. 1829 (*triphyllus*); ed. 6, 257. 1833; ed. 7, 430, 1836; ed. 8, 351. 1840 = *Phaca caespitosa* Nutt. (*Orophaca caespitosa* Britton).

Pursh is erroneously indicated as the authority, the footnote reference being "caespitosa, N. Astragalus, Ph."; the name-bringing synonym would be *Astragalus triphyllus* Pursh (1814), non Pall. (1800). The "Index Kewensis" reference is to the Eaton and Wright edition of 1840.

Phaseolus †caribaeus Eaton, Man. ed. 6, 259. 1833; ed. 7, 433. 1836; ed. 8, 353. 1840 = *Rhynchosia minima* (Linn.) DC.

This was placed under *Phaseolus* subgenus *Rhynchosia,* but no authority or synonymy indicated. Its basis was clearly *Rhynchosia caribaea* DC. as various authors have interpreted that. It is entered in "Index Kewensis" as "Eaton & Wright, N. Am. Bot. ed. VIII. 353 [1840]."

Phaseolus *difformis Eaton, Man. ed. 6, 259. 1833; ed. 7, 432. 1836 = *Rhynchosia tomentosa* (Linn.) Hook. & Arn.

This was placed by Eaton under the subgenus *Rhynchosia,* but no authority or synonymy cited. Its basis was clearly *Rhynchosia difformis DC.* (*Glycine tomentosa* Linn. var. *volubilis* Michx.).

Phaseolus *erectus Eaton, Man. ed. 6, 259. 1833 (*erecta*); ed. 7, 432. 1836 = *Rhynchosia erecta* (Walt.) DC.

No authority cited and no synonyms indicated. It was placed under *Phaseolus,* subgen. *Rhynchosia,* and like other names in this category it was perhaps not Eaton's intent to transfer the species to *Phaseolus.* The name-bringing synonym was clearly *Rhynchosia erecta* (Walt.) DC.

Phaseolus †frutescens Eaton, Man. ed. 6, 259. 1833; ed. 7, 433. 1836; ed. 8, 354. 1840 = *Wisteria frutescens* (Linn.) Poir.

This was placed under the genus *Phaseolus,* subgenus *Wistaria,* no authority given. The footnote reference is "Thyrsanthus, Glycine." Thus the name-bringing synonym would be

Glycine frutescens Linn. The "Index Kewensis" entry is "Eaton & Wright, Bot. N. Am. ed VIII. 354. [1840]."

Phaseolus latifolius Eaton & Wright, N. Am. Bot. 353. 1840 (*latifolia*) = *Rhynchosia latifolia* Nutt.

The entry in Index Kewensis is correct. Eaton indicates the authority as "N" = Nuttall, placing it in the subgenus *Rhynchosia;* this would be *R. latifolia* Nutt. ex Torr. & Gray., Fl. N. Am. **1**: 285. 1838.

Phaseolus menispermoideus Eaton & Wright, N. Am. Bot. 353. 1840 (*menispermoidea*) = *Rhynchosia menispermoidea* DC.

The authority is erroneously given as de Candolle, no synonym cited; its basis was clearly *Rhynchosia menispermoidea* DC. It is correctly entered in "Index Kewensis."

Phaseolus †monoicus Eaton, Man. ed. 6, 259. 1833 (*monoica*); ed. 7, 432. 1836; ed. 8, 353. 1840 = *Amphicarpaea bracteata* (Linn.) Fernald.

The authority is indicated as Elliott, the species being placed in the subgenus *Amphicarpa.* The name-bringing synonym, not cited, would be *Amphicarpaea monoica* Ell. The "Index Kewensis" entry is to the 1840 edition.

Phaseolus pitcheri Eaton & Wright, N. Am. Bot. 353. 1840 = *Amphicarpaea pitcheri* Torr. & Gray.

This was placed under *Phaseolus,* subgenus *Amphicarpa,* no synonym cited. Its basis was clearly *A. pitcheri* Torr. & Gray. The entry in "Index Kewensis" is correct.

Phaseolus †reniformis Eaton, Man. ed. 6, 259. 1833; ed. 7, 432. 1836; ed. 8, 353. 1840 = *Rhynchosia reniformis* (Pursh) DC. (*R. simplicifolia* Wood, 1861, non Walp., nec DC.).

No authority is given and no synonym is cited. The name originated with *Rhynchosia reniformis* (Pursh) DC. The "Index Kewensis" entry is to the edition of 1840.

Phaseolus *sarmentosus Eaton, Man. ed. 6, 259. 1833; ed. 7, 432. 1836 (*sarmentosa*) = *Amphicarpaea bracteata* (Linn.) Fernald.

No authority is indicated and no synonyms are listed. It was placed in the subgenus *Amphicarpa,* its basis hence being *A. sarmentosa* Ell.

Philoxerus *vermicularis (Linn.) Beauv., Fl. Oware Benin **2**: 65. 1818; Eaton, Man. ed. 5, 327. 1829; ed. 6, 260. 1833; ed. 7, 433. 1836; ed. 8, 354. 1840; Mart. ex Moq. in DC. Prodr. **13**(2): 340. 1864.

For a discussion of the somewhat confused situation in reference to the authority for the binomial see above under *Achyranthes vermicularis* Eaton. Eaton, in a footnote, indicated "Illecebrum L." as the basis of his name.

Phlox †revoluta Aikin ex Eaton, Man. ed. 7, 435. 1836; ed. 8, 355. 1840 = *Phlox carolina* Linn.

Aikin's description is ample. His type was from Maryland. The "Index Kewensis" reference is "Aikin, ex A. Gray, Syn. Fl. N. Am. ii. I. 130 [1878]" where it appears as a synonym of *P. glaberrima* Linn. Wherry in Bartonia 13: 36. 1932, cites it in synonymy of *P. carolina triflora* (Michx.) Wherry (*P. triflora* Michx.)

***Pickeringa** Eaton, Man. ed. 7, 438. 1836; ed. 8, 357. 1840 = *Pickeringia* Nutt. (1834) = *Ardisia* Sw. (1788).

Pickeringa *paniculata Eaton ll.cc. = *Pickeringia paniculata* Nutt. = *Ardisia escallonioides* Cham. & Schlect.

Eaton's naive explanation of the slight change in spelling of Nuttall's generic name is: "Mr. Nuttall spells this name Pickeringia; changing the sound of the letter G. unnecessarily."

Piptatherum *racemosum Eaton, Man. ed. 5, 331. 1829; ed. 6, 266. 1833; ed. 7, 441. 1836; ed. 8, 359. 1840 = *Oryzopsis racemosa* (J. E. Smith) Ricker.

Eaton credits this to "S" = J. E. Smith, the footnote references being "nigrum, T. Milium, S. Oryzopsis melanocarpa, M." The name-bringing synonym is thus *Milium racemosum* J. E. Smith. Synonyms are *Oryzopsis melanocarpa* Muhl. and *Piptatherum nigrum* Torr.).

Poa *festucoides Torr. ex Eaton, Man. ed. 2, 367. 1818, non Lam. — *Festuca obtusa* Spreng.

"Torrey. A new species, discovered by J. Le Conte, esq." The letter "C" indicates Columbia College, i.e., vicinity of New York City. We find no other published record of Torrey's binomial.

Poa *philadelphica Barton, Compend. Fl. Phila. **1**: 62. 1818; Eaton Man. ed. 3, 396. 1822; ed. 4, 400. 1824 = *Eragrostis cilianensis* (All.) Link.

The binomial was correctly credited to "B." = Barton, the footnote reference being "obtusa N.", i.e., *Poa obtusa* Nutt., for which Barton's name was proposed as a new one. Hitchcock, Man. Grasses U. S. 848. 1935, correctly cites Barton's original place of publication.

Polygala *viridi-alba Eaton, Man. ed. 7, 448. 1836 = *P. viridescens* Linn.

No authority is given. The footnote is "viridescens, a doubtful species of W[illdenow] as applied by Ph [Pursh]."

Polygonum †fluitans Eaton, Man. ed. 5, 338. 1829; ed. 6, 274. 1833; ed. 7, 460. 1836; ed. 8, 368. 1840 = *P. natans* Eaton = *P. amphibium* Linn., var. *stipulaceum* Colem., forma *fluitans* (Eaton) Fernald.

The description is essentially the same as that of the earlier *P. natans* Eaton and was based on the same material. The footnote is: "amphibium, var. natans, 3d ed. Manual, and var. aquaticum T." Regarding it he also says: "I have watched this and the two preceding species [*P. amphibium* Linn., *P. coccineum* Muhl.] several years, and am satisfied that they are distinct. Finding this to be a new one, not var. natans of Mx. I give it a new name." It is the same form as that described as *P. natans* Eaton in 1822 and 1824. For the latest consideration of this form see Fernald, in Rhodora **48**: 49-53. 1946. The "Index Kewensis" entry is "*fluitans*, Eaton, Man. ed. VI. 274 [1833]."

Polygonum *natans Eaton, Man. ed. 3. 400. 1822; ed. 4, 404. 1824; Stanford, in Rhodora **27**: 159. 1925, cum. syn = *P. fluitans* Eaton = *P. amphibium* Linn., var. *stipulaceum* Colem., forma *fluitans* (Eaton) Fernald.

The type was from Whiting's Pond, and Eaton's specimen is in book two of his herbarium at Yale University labelled: "Polygonum coccineum? I found great growths of this species in Whiting's Pond, Canaan, N. Y. Is not this a new species, which ought to be called P. natans?" His description is an unusually ample one. Later under *P. fluitans* Eaton he recorded it also from Botany Pond, three miles east of Albany, N. Y. Following the description he states: "It is the P. amphibium. Var. natans of Mx. and a variety of the coccineum of Willdenow. But it appears sufficiently distinct for a species." In editions five (1829) to eight (1840) of the Manual it appears as *P. fluitans* Eaton.

Polygonum *virginicum Eaton, Man. 45. 1817 = *P. virginianum* Linn. (*Tovara virginiana* Raf.).

Correctly entered as *P. virginianum* Linn. in all later editions of Eaton's work.

Prunus * emarginata Eaton, Man. ed. 7, 463. 1836.

This name antedates *Prunus emarginata* (Dougl.) Walp., Repert. **2**: 9. 1843, by seven years. It was erroneously credited to Douglas, the letter "R" indicating that its range was the Rocky Mountains or beyond. No synonym was given, but in edition eight at the end of the description of *Cerasus emarginata* Dougl. is the entry "Prunus, emarginata." Thus the basis of Eaton's binomial was *Cerasus emarginata* Dougl. ex Hook., Fl. Bor. Am. **1**: 169. 1834 = Prunus emarginata (Dougl.) Eaton.

Queria †argyrocoma Eaton, Man. ed. 5, 357. 1829; ed. 6, 295. 1833; ed. 7, 475. 1836 = *Paronychia argyrocoma* (Michx.) Nutt.

The authority is erroneously indicated as "M" = Muhlenberg, the footnote being "Anychia, Mx. Paronychia, Ju." The name-bringing synonym is thus *Anychia argyrocoma Michx.* (1803), this being the name that Muhlenberg used (Cat. 27. 1813). In edition eight of Eaton's work it appears as *Paronychia argyrocoma* Nutt. The "Index Kewensis" entry is "Eaton, N. Am. Bot. ed. VII, ex Eaton & Wright, N. Am. Bot. ed. VIII. 343. [1840]."

Queria *hernarioides Eaton, Man. ed. 5, 357. 1829; ed. 6, 295. 1833; ed. 7, 475. 1836 = *Paronychia hernarioides* (Michx.) Nutt.

This is erroneously credited to Michaux, the footnote reference being "Anychia, Mx. Paronychia, Ju." Its basis was *Anychia hernarioides* Michx. (1803). Synonyms are *Anychiastrum hernarioides* Small and *Gastronychia hernarioides* Small.

Queria †sessiliflora Eaton, Man. ed. 5, 357. 1829; ed. 6, 295. 1833; ed. 7, 475. 1836 = *Paronychia sessiliflora* Nutt.

This name was erroneously credited to Nuttall, the footnote reference being "Paronychia, N." The "Index Kewensis" entry is "Eaton, N. Am. Bot. ed. VII; ex Eaton & Wright, N. Am. Bot. ed. VIII. 343 [1840]."

Ranunculus †delphinifolius Torr. ex Eaton, Man. ed. 2, 395. 1818; ed. 3, 424. 1822; ed. 4, 424. 1824.

"A new species by Dr. Torrey; though he suspects it may be a variety of the fluviatilis". The type was from the vicinity of New York City, "C" = Columbia College. The "Index Kewensis" entry is "Torr. in Eaton, Man. Bot. ed. IV. 424 [1824]," corrected in the Addenda to Suppl. 1, to ed. 2, p. 395. A valid species of wide distribution in Eastern North America.

Ranunculus intermedius Eaton, Man. ed. 3, 424. 1822; ed. 4, 424. 1824 = *Ranunculus repens* Linn.

Eaton's specimen was from the vicinity of Albany, N. Y. In edition four the authority is indicated as "S" = J. E. Smith, which probably means that Eaton thought he had *R. intermedius* Poir. in Lam., Encycl. **6:** 116. 1804 as interpreted by J. E. Smith in Rees Cyclop. **29:** no. 56. 1814. The entry in Index Kewensis is correct.

Ranunculus †lacustris Beck & Tracy ex Eaton, Man. ed. 3, 423. 1822; in N. Y. Med. Phys. Jour. **2**: 112. 1823; in Trans. Albany Inst. **1**: 148. 1830; Beck, Bot. N. Mid. States 9. 1833; Eaton, Man. ed. 4, 424. 1824; ed. 5, 359. 1829; ed. 6, 298. 1833; ed. 7, 477. 1836 = *R. delphinifolius* Torr. (1818).

This was from a small lake east of Lansingburgh, near Albany, N. Y. The footnote in edition three of Eaton's "Manual" is "multifidus ? Bradbury, fluviatilis? Bw. [Bigelow]. See his [Bigelow's] enlarged description, p. 139. Boston Flora." The original "Index Kewensis" entry is to the Transactions of the Albany Institute reference; the second entry appears in the Addenda to Suppl. 1.

Ranunculus †nitidus Muhl., Cat. 54. 1813, *nomen nudum*; ed. 2, 56. 1819, *nomen nudum*; Eaton, Man. ed. 2, 396. 1818; ed. 3, 425. 1822; ed. 4, 425. 1824; ed. 5, 359. 1829; ed. 6, 299. 1833; ed. 7, 478. 1836; ed. 8, 388. 1840 = ? *R. repens* Linn.

The entry in "Index Kewensis" is to "Muhl. Cat. ed. II. 56," the name being validated by Eaton's description of 1818. All that Muhlenberg says about the species is that it was from Carolina, and "an varietas repentis?" Clearly what he thought he had was *Ranunculus nitidus* Walt., Fl. Carol. 159. 1788, but here, as in most other cases, he cited no authority. In editions three and four Eaton credited the species to "Wr." = Walter, but in later editions to "M" = Muhlenberg, "not Wr." and it may be significant that he placed the species among the southern ones.

Ranunculus †saniculaeformis Muhl., Cat. 54. 1813, *nomen nudum*; ed. 2, 56. 1818, *nomen nudum*; Eaton, Man. ed. 2, 397. 1818; ed. 3, 425. 1822; ed. 4, 425. 1824 = *Ranunculus recurvatus* Poir. (1804).

Eaton says: " Muhl. credits this plant to Delaware only. Last summer Dr. Torrey found it near New York, and drew this description from living specimens. Dr. Beck found it also growing near Albany." Here Eaton apparently published the first description of Muhlenberg's species, thus validating what was up to that time a *nomen nudum*. The Index Kewensis entry is " Muhl. ex DC. Prodr. I. 40 [1824]," where the name appears, on the authority of Rafinesque, as a synonym of *Ranunculus recurvatus* Poir.

Reseda *micrantha Eaton & Wright, N. Am. Bot. 389. 1840 (*micranthus*), *sphalm.* = *Ranunculus micranthus* Nutt.

Another of those curious errors where the author inadvertently made the entry under the wrong generic name. The specis was credited to Nuttall, the range given as Missouri and Arkansas. The basis was clearly *Ranunculus micranthus* Nutt.

Rhynchospora *teres Eaton, Man. ed. 5, 364. 1829; ed. 6, 304. 1833; ed. 7, 484. 1836; ed. 8, 394. 1840 = *R. cymosa* Ell. = *R. glomerata* (Linn.) Vahl; see Gale, in Rhodora **46**: 113. 246-248. 1944.

The authority is correctly given as " Ea " = Eaton in editions five to seven, but erroneously as " E " = Elliott in edition eight. The footnote reference is " cymosa, E. As Elliott's plant differs essentially from the cymosa of M[uhlenberg] it becomes necessary to give it another name." Elliott, Sketch **1**: 58. 1816, credits the name *Rhynchospora cymosa* to " Muhl. Cat.". But Muhlenberg apparently never published such a binomial, but rather *Schoenus cymosus* Muhl., Cat. 6. 1813, ed. 2, 5. 1818, strictly a *nomen nudum;* Descr. Gram. 8. 1817, *descr.*, non Willd. This is *Rhynchosphora globularis* (Chapm.) Small, var. *recognita* Gale, in Rhodora **46**: 245. 1944, a species distinct from *R. teres* Eaton = *R. glomerata* (Linn.) Vahl. The original spelling of the generic name was *Rynchospora*.

Rhynchospora *variflora Eaton, Man. ed. 5, 363. 1829; ed. 6, 304. 1833; ed. 7, 484. 1836, *sphalm.*; ed. 8, 393. 1840 (*veriflora*) = *Rhynchospora rariflora* (Michx.) Ell.

The authority is erroneously indicated as Michaux, the origin of the specific name being clearly *Schoenus rariflorus* Michx., Fl. Bor. Am. **1**: 35. 1803; the footnote reference is " micrantha, Vahl."

Rosa *sabifolia Eaton & Wright, N. Am. Bot. 397. 1840, *sphalm.* = *R. rubifolia* R. Br. = *R. setigera* Michx.

The entry in editions one to seven is as *R. rubifolia* R. Br. On p. IV this statement appears " Rosa sabifolia should be Rosa rubiginosa," but the latter is a Linnaean species of the Old World, so that this " correction " is probably an error.

Rumex *hastatulus Baldw. ex Ell. Sketch **1**: 416. 1817; Eaton, Man. ed. 5, 372. 1829; ed. 6, 314. 1833; ed. 7, 497. 1836; ed. 8, 404. 1840; Robins. & Fernald in Gray, Man. ed. 7, 357. fig. 704. 1908; Small, Man. Southeast. Fl. 447. *fig.* 1933.

The " Index Kewensis " entry is *Rumex hastulatus* " Baldw. ex Meissn. in DC. Prodr. xiv. 64 [1856] " in syn. sub *R. engelmanni* Ledeb. It is a valid species, extending from Massachusetts to Florida and Texas, and inland north to Illinois.

Salix *obovata Pursh, Fl. Am. Sept. **2**: 611. 1814. Prob. = *S. cordifolia* Pursh, var. *callicarpaea* (Trautv.) Fernald in Rhodora **28**: 184. 1926.

Our attention was called to this unlisted name through Eaton's inclusion of the species in his Manual, edition five (1829) to eight (1840). Pursh says: " In Labrador *Colmaster,* Northwest coast, *Nelson*."

Sanguisorba *medica Eaton, Man. 18. 1817, *sphalm.* = *S. media* sensu Hook. (1834), non Linn. = *S. *stipulata* Raf., Herb. Raf. 47. 1833 (*S. sitchensis* C. A. Mey., 1856; *S. latifolia* Coville, 1896); see Fernald in Rhodora **48**: 12. 1946.

Eaton corrected his error in the spelling of the specific name to *S. media* in all the later editions of his Manual.

Sarracenia †heterophylla Eaton, Man. ed. 3, 447. 1822; ed. 4, 445. 1824; ed. 5, 380. 1829; ed. 6, 324. 1833; ed. 7, 508. 1836; ed. 8, 412. 1840 = *S. purpurea* Linn. var. *heterophylla* (Eaton) Torr., Fl. N. Y. **1**: 41. 1843.

The "Index Kewensis" entry is to edition four (1824). Eaton's original specimen is in book three of his herbarium at Yale University. "Found in a swamp near Northampton (Mass.) by Dr. David Hunt in the summer of 1818. I suspect it to be a new species, which should be called S. heterophylla." This is one of the few specimens in the herbarium where any data are given other than the name.

Schrankia *sensitiva Eaton, Man. ed. 5. 383. 1829; ed. 6, 328. 1833; ed. 7, 514. 1836; ed. 8, 416. 1840 = *Mimosa sensitiva* Linn.

The footnote reference is to *Mimosa* [*sensitiva*] of earlier editions. It was placed among the exotic species.

Scirpus *depilatus LeConte ex Eaton, Man. ed. 2, 427. 1818 = *Eleocharis parvula* (R. & S.) Link.

"A new species discovered by J. Le Conte, Esq." The habitat is indicated as the borders of salt marshes and the locality ("C" = Columbia College) in the vicinity of New York City. The habitat and locality limits the identity of this to four possible species and Dr. Svenson, to whom the problem of identity was submitted, states that Eaton's description applies to *Eleocharis parvula* (R. & S.) Link.

Scirpus *ferrugineus Eaton, Man. ed. 2, 428. 1818; ed. 3. 452. 1822; ed. 4, 449. 1824, non Linn. = *Fimbristylis puberulus* (Michx.) Vahl.

Eaton credited the species to Muhlenberg but the only entry we have found in the latter's works is in his Catalogue 7. 1813, where *S. ferrugineus* Linn. appears as a synonym of *S. puberulus* Michx. In edition three when Eaton commenced to cite authorities for the binomials, *S. puberulus* Michx. is added in a footnote.

Scirpus †glaucus Torr. ex Eaton, Man. ed. 2, 426. 1818; Torr., Fl. North. Mid. U. S. **1**: 44. 1824, non aliorum = *Eleocharis calva* Torr. (1843); see Svenson in Rhodora **31**: 68. 1929.

Eaton says: "This was one of Muhlenberg's anonymous species. Dr. Torrey found the same near New York, and gave it this name." Torrey says that it was "Scirpus No. 7 (anonymos) *Muhl. Gram.* p. 29," and that it occurred along the borders of salt marshes near New York City. The "Index Kewensis" entry is "Torr. Fl. U. St. 44 [1824]." Eaton dropped the species in editions three (1822) to five (1829), but reinstated it with a greatly abbreviated description in editions six to eight.

Scirpus *gracilis Torr. ex Eaton, Man. ed. 2, 431. 1818, non aliorum = *Eleocharis tenuis* Willd. (1809).

The letter "C" indicated Columbia College, i. e., that Torrey's specimen was from the vicinity of New York City. Regarding it Eaton says: "On the borders of salt marshes. Torrey. A new species discovered by J. Le Conte, Esq." This apparently was another supposedly new species that Torrey withdrew, for we have found no references to it elsewhere than in this second edition of Eaton's "Manual." The identification is by Dr. H. K. Svenson.

Scleria *reticulata Eaton, Man. ed. 5, 486. 1829; ed. 6, 331. 1833; ed. 7, 518. 1836; ed. 8, 419. 1840 = *S. reticularis* Michx.

The binomial was credited to Michaux, the error being in the transcription of the specific name, or perhaps a deliberate change was made.

Scutellaria †cordifolia Muhl., Cat. 56, 1813, *nomen nudum*; ed. 2, 59. 1819, *nomen nudum*; Eaton, Man. ed. 2, 433. 1818; ed. 3, 456. 1822; ed. 4, 452. 1824; ed. 5, 387. 1829; ed. 6, 333. 1833; ed. 7, 519. 1836; ed. 8, 420. 1840; Ell. Sketch **2**: 91. 1821 = *S. versicolor* Nutt., Gen. **2**: 38. 1818.

Britton is the authority for the statement, Britton & Brown, Ill. Fl. North. U. S. ed. 2, **2:** 673. 1913, that Nuttall's work appeared before edition two of Eaton's Manual, both published in 1818. Nuttall cites " S. cordifolia ? Muhl. Cat." as a synonym of his species. Eaton cites Muhlenberg as the author of *S. cordifolia* with *S. versicolor* Nutt. listed in the footnote as a synonym. Elliott's description of Muhlenberg's species is much more complete than is that of Eaton. The " Index Kewensis " entry is " Muhl. Cat. ex Benth. in DC. Prodr. xii. 422. [1848]."

Scutellaria *laevigata Aikin ex Eaton, Man. ed. 6, 333. 1833; ed. 7, 519. 1836; ed. 8, 420. 1840 = *S. serrata* Andr. (1809).

The " M " following the description indicates Maryland. Dr. William E. Aikin was an associate of H. H. Eaton, son of Amos Eaton, in preparing the text of the fifth edition of the Manual; see p. vi of the introduction to edition six.

Sedum *nuttallii Eaton, Man. ed. 6, 334. 1833; ed. 7, 520. 1836; ed. 8, 421. 1840 = *S. nuttallianum* Raf. (1832).

This was credited to " T. & J." and clearly refers to the species no. 171, characterized by Torrey, but not named, in his report on the James collection, in Ann. Lyc. Nat. Hist. N. Y. **2:** 205. 1827, where the entry is " S. *n. sp.* Nutt. Near the Rocky Mountains. Leaves roundish, flat, entire, scattered; cymes terminal, trichotomous." This short description was also the basis of *Sedum nuttallianum* Raf., Atl. Jour. **1:** 146. 1832, Rafinesque citing " S. anon. T. 171." *Sedum torreyi* G. Don (1834) is a synonym.

Serpicula †canadensis Eaton, Man. ed. 5, 390. 1829; ed. 6, 336. 1833; ed. 7, 523. 1836; ed. 8, 423. 1840 = *Anacharis canadensis* (Michx.) Planch.

Eaton erroneously credits this to Michaux, his footnote being " occidentalis, Ph. Verticillata, M. Elodea, Mx. Udora, N." The basis of the name is therefore *Elodea canadensis* Michx. *Philotria canadensis* Britton is a synonym.

Sison *costatus Eaton, Man. ed. 5, 394. 1829; ed. 6, 341. 1833 = *Ptilimnium costatum* (Ell.) Raf.

Eaton erroneously credits the authority to " E " = Elliott. The footnote reference is " Ammi, E." and thus *Ammi costatum* Ell. provided the name.

Sison †majus Eaton, Man. ed. 7, 529. 1836; ed. 8, 429. 1840 = *Ammi majus* Linn.

The authority is indicated as de Candolle. The footnote reference from the generic name is: " These species should have been described under Ammi." The " Index Kewensis " entry is " Eaton & Wright, N. Am. Bot. ed. VIII. 429. [1840]."

Sison †rubricaule Eaton, Man. ed. 7, 530. 1836; ed. 8, 429. 1840 = *Ptilimnium capillaceum* (Michx.) Raf.

The authority is indicated as de Candolle; see note under the preceding species. The " Index Kewensis " entry is to the Eaton & Wright edition of 1840.

Sisymbrium †cheiranthoides Eaton, Man. ed. 5, 395. 1829; ed. 6, 342. 1833; ed. 7, 530. 1836; ed. 8, 829. 1840 = *Erysimum cheiranthoides* Linn. (*Cheirinia cheiranthoides* Link).

The authority is not indicated. The footnote reference is to " parviflora, P.", i.e. *Erysimum parviflorum* Pers. The " Index Kewensis " entry is " Eaton & Wright, N. Am. Bot. ed. VIII. 429 [1840]; Trautv. in Act. Hort. Petrop. V (1877) 27."

Sisymbrium †lyratum Eaton, Man. ed. 7. 530. 1836; ed. 8, 430. 1840 (*lyrata*) = *Arabis lyrata* Linn.

In the footnote Eaton states: " arabidoides, Hk. see p. 164, where Hooker misled me. A[rabis] lyrata must be struck out under the species, petrea; as this is the true A. lyrata." The basis of Eaton's binomial hence was *A. lyrata* Linn.

Sisyrinchium *brachycarpum Eaton, Man. ed. 6, 342. 1833; ed. 7, 531. 1836 = *Descurainia richardii* (Sweet) O. E. Schulz.

A new binomial due to Eaton's inadvertent entry of a *Sisymbrium* description under the iridaceous genus *Sisyrinchium* for the description is of a cruciferous plant. The authority is indicated as Hooker, *S. brachycarpum* as interpreted by Hooker, Fl. Bor. Am. **1**: 62. 1830 = *S. brachycarpon* Richards. in Frankl. Narr. First Journ. App. 744. 1823; ed. 2, 27. 1823 (*brachycarpum*), these names being the basis of Eaton's binomial.

Sisyrinchium *humile Eaton, Man. ed. 6, 342. 1833; ed. 7, 531. 1836 = *Sisymbrium humile* Hook.

Another erroneous entry, *Sisymbrium* being intended. The authority is indicated as Hooker, the description being of *Sisymbrium humile* Hook., Fl. Bor. Am. **1**: 62. 1830.

Smilax *cincidifolia Eaton, Man. ed. 5, 396. 1829; ed. 6, 343. 1833; ed. 7, 532. 1836; ed. 8, 431. 1840, *sphalm.* = *S. cercidifolia* Pursh, Fl. Am. Sept. **2**: 733. 1814 (*circidifolia*).

The authority is cited as "Ph." = Pursh, Eaton's brief description clearly taken from Pursh's diagnosis. The entry in "Index Kewensis" is as *cercidifolia* Pursh, a correction of his original spelling.

Specularia *amplexicaulis Eaton, Man. ed. 7, 54. 1836; ed. 8, 439. 1840 = *S. perfoliata* (Linn.) A. DC.

The entry is merely "amplexicaulis, O[= all authors] & speculum. Exotic, described under Campanula." This is *Campanula amplexicaulis* Michx. as entered in these two editions of Eaton's Manual, p. 209 and 167. The footnote reference is "perfoliata, L.", that is, *Campanula perfoliata* Linn.

Starkea *spinulosa ("spinulosus") Eaton, Man. ed. 5. 410. 1829; ed. 6, 356. 1833; ed. 7, 546. 1836; ed. 8, 442. 1840 = *Haplopappus* (*Aplopappus*) *spinulosus* (Pursh) DC. (*Sideranthus spinulosus* Sweet).

Eaton erroneously indicated the authority as "Ph." = Pursh, the footnote reference being "Amellus, Ph.", that is, *Amellus spinulosus* Pursh.

Streptanthus *ovalifolius Eaton, Man. ed. 7, 549. 1836; ed. 8, 444. 1840 = *S. obtusifolius* Hook. (1834) = *S. maculatus* Nutt. (1825).

This is practically a *nomen nudum*. All that Eaton says is "(Arkansas cabbage). I have received no description of this species other than what is implied by the name—leaves oval. Grows in Arkansas." The name that Hooker actually published for the "Arkansas cabbage" was *Streptanthus obtusifolius* Hook. in Bot. Mag. **61**: pl. 3317. 1834. Eaton credits the authority to Hooker.

Thapsia *acaulis Eaton, Man. ed. 5, 416. 1829; ed. 6, 363. 1833 = *Cymopterus acaulis* (Pursh) Raf.

This is erroneously credited to "Ph." = Pursh, the footnote reference in edition six being to "glomerata, N. Selinum, Ph., Cymopteris Raf. in DC." Its basis is hence *Selinum acaule* Pursh.

Tillaea †ascendens Eaton, Man. ed. 2, 465. 1818; ed. 3, 487. 1822; ed. 4, 479. 1824; ed. 5, 419. 1829. ed. 6, 265. 1833; ed. 7, 558. 1836; ed. 8, 453. 1840 = *Tillaea aquatica* Linn. (*Tillaeastrum aquaticum* Britton).

The basis of Eaton's species was a specimen collected by Prof. Ives on the Housatonic River, Connecticut; later it was recorded from Peekskill, New York. The "Index Kewensis" entry is to edition five (1829) of Eaton's "Manual."

Tillandsia *prinifolia Eaton. Man. ed. 6, 366. 1833; ed. 7, 559. 1836; ed. 8, 453. 1840, *sphalm.* = *T. pinifolia* Le Conte = *T. juncea* (R. & P.) Poir.

The entry in ed. 5, 419. 1829, is correct as *Tillandsia pinifolia* Le Conte.

***Torreya** Eaton, Man. ed. 5, 420. 1829; ed. 6, 64, 367. 1833; ed. 7, 77, 560. 1836, non Raf., 1818, nec Raf., 1819, nec Spreng. 1821 = *Nuttallia* Raf. (1818) = *Mentzelia* Linn.

This was proposed as a new name for *Bartonia* Nutt. (1818), non *Bartonia* Muhl. (1801), and is thus the sixth use of the same generic name for six different groups of plants, *Torreya* Arn. (1838) being officially conserved. Synonyms of *Torreya* Eaton are *Nuttallia* Raf. (1818), *Touterea* Eaton & Wright (1840), and *Hesperaster* Cockerell (1901), Rydberg recognized the first as a distinct genus in 1917, 1923, and 1932. Eaton's explanation (as phrased in edition 7) of his selection of the generic name *Torreya* is as follows: "Another plant has long since received the name Bartonia. Several plants of doubtful character have been named in honor of Dr. Torrey. But, I believe, all American botanists will consent to give his name to *a definite genus*. I received Mr. Nuttall's assent to this name, at his garden in Cambridge, Mass. As I am the oldest teacher of *popular botany* in North America, and as I taught our modern Linneus[10] [John Torrey] the very name of calyx, corol and stamen, at his early age of fourteen, Mr. Nuttall was willing to permit me to give this name to a plant of his discovery [*Bartonia ornata* Pursh; *Bartonia* Sims, 1804, non *Bartonia* Muhl., 1801]. Dr. Torrey was not consulted; but about twenty of our best American botanists were consulted." But as Eaton consistently ignored Rafinesque's erratic work, he failed to realize that *Nuttallia* Raf. had been proposed in 1818 for the same group.

Torreya *nuda Eaton, Man. ed. 5, 420. 1829; ed. 6, 367. 1833; ed. 7, 560. 1836 = *Mentzelia nuda* (Pursh) Torr. & Gray (*Nuttallia nuda* Rydb.).

The authority was erroneously indicated as Nuttall, no synonym cited. From the footnote regarding the generic name this was derived from *Bartonia nuda* Pursh as interpreted by Nuttall, Gen. **1**: 299. 1818.

Torreya *ornata Eaton, Man. ed. 5, 421. 1829; ed. 6, 367. 1833; ed. 7, 560. 1836 = *Mentzelia decapetala* (Pursh) Urban & Gilg. (*M. ornata* Torr. & Gray; *Nuttallia decapetata* Rydb.).

This species was also erroneously credited to Nuttall, no synonym cited. Its basis was clearly *Bartonia ornata* Pursh as interpreted by Nuttall. Incidentally, Nuttall's long footnote on Pursh is worthy of perusal; see Nuttall, Gen. **1**: 298. 1818.

***Touterea** Eaton & Wright, N. Am. Bot. 454. 1840 = *Hesperaster* Cockerell (1901) = *Nuttallia* Raf. (1818) = *Mentzelia* Linn.

This was proposed as a new generic name for *Torreya* Eaton (1829), non Raf. (1818, 1819), nec Spreng. (1821), nec Arn. (1838). Eaton & Wright say "Touterea Gr. *touteron*, another. A temporary name given from its having been published as Bartonia and Torreya; and been driven from both by other applications of both names. The word 'another' may stand as a name for this edition."

Touterea *nuda Eaton & Wright, l. c. = *Mentzelia nuda* (Pursh) Torr. & Gray (*Nuttallia nuda* Rydb.)

Touterea *ornata Eaton & Wright, l. c. = *Mentzelia decapetala* (Pursh) Urban & Gilg (*Nuttallia decapetala* Rydb.).

Trichodium *perenneum Eaton, Man. ed. 5, 423. 1829; ed. 6, 369. 1833; ed. 7, 562. 1836; ed. 8, 456. 1840 = *Agrostis perennans* (Walt.) Tuckerm.

The authority is erroneously given as "Wr." = Walter, who, however, originated the name in *Cornucopia perennans* Walt., Fl. Carol. 74. 1788. The footnote reference is "decumbens, Mx. Cornucopia, Wr."

---

[10] In edition 5 Eaton had said, in part: "I feel confident, that every American botanist, as well as the discoverer, will cordially unite with me in giving to this splendid genus, a name which seems to be almost identified with the science, on this side of the Atlantic. Dr. Torrey proposed Nuttallia for the generic name. But that name is already given to a well defined genus."

Trichophorum *eriophorum Eaton, Man. 11. 1817 = ? *Eriophorum virginicum* Linn.
The very short description is " (light-hair) culm leafy; spike crowded."

Trifolium †stoloniferum Muhl., Cat. 67. 1813, *nomen nudum*; ed. 2, 70. 1819, *nomen nudum*; Eaton, Man. ed. 2, 468. 1818; ed. 3, 491. 1822; ed. 4, 483. 1824; ed. 5, 424. 1829; ed. 6, 370. 1833; ed. 7, 564. 1836; ed. 8, 457. 1840; Beck, Bot. N. Mid. States 80. 1833.

This is an accepted species, but Muhlenberg's original entry does not constitute valid publication. He says "running buffaloe clover", that the corolla was white and that it occurred in Ohio, Kentucky, and Pennsylvania. Eaton says: "This description I drew from a dried specimen in the herbarium of T. R. Beck; being unable to procure any other." This was from Western New York where Muhlenberg's species is not now known to occur. Beck says "N. Y. Penn. W. to the Miss." Eaton later, Manual ed. 5, 424. 1829, repeated the statement regarding his description having been based on a Beck specimen and adds: "Pursh [Beck ?] had drawn one [a description] from the same specimen. As I have not seen any improved description of this plant in the floras of those who have examined Muhlenberg's herbarium, I retain this for the present." We suspect that Beck was the name that Eaton should have used rather than Pursh, for Pursh never published a description of *T. stoloniferum* Muhl. at least under that name. The plant is known to occur in Pennsylvania and West Virginia, and probably did formerly grow in western New York. In any case the specimen Eaton had would be the type, although it does not appear to be still extant.

Trigonella †sericea Eaton, Man. ed. 5, 424. 1829; ed. 6, 371. 1833; ed. 7, 565. 1836; ed. 8, 459. 1840 = *Hosackia americana* (Nutt.) Piper.

The authority is erroneously indicated as "Ph." = Pursh, the footnote being "americana, N. Lotus, Ph." These are *Trigonella americana* Nutt. and *Lotus sericeus* sensu Pursh, non DC. The "Index Kewensis" entry is "Eaton & Wright, N. Am. Bot. ed. VIII. 459 [1840]."

Uraspermum *canadense Eaton, Man. ed. 5, 430. 1829 = *Cryptotaenia canadensis* (Linn.) DC.
The footnote reference is "Sison, L. Myrrhis, 4th Ed. Chaerophyllum, P." The basic synonym is hence *Sison canadense* Linn.

Uraspermum *procumbens Eaton, Man. ed. 5, 430. 1829; ed. 6, 377. 1833; ed. 7, 572. 1836 = *Chaerophyllum procumbens* (Linn.) Crantz.

No authority is cited, the footnote reference being "Scandix, L. Chaerophyllum, Lk. Myrrhis, Sl. [Spreng.]" the basic synonym thus being *Scandix procumbens* Linn.

Vaginaria *scirpoides Eaton, Man. ed. 5, 435. 1829; ed. 6, 382. 1833; ed. 7, 577. 1836; ed. 8, 468. 1840 = *Fuirena scirpoidea* Michx.

The authority is erroneously indicated as Michaux, the footnote being "richardi, *P. Fuirena*, Mx." and the name-bringing synonym being *Fuirena scirpoidea* Michx.

Valerianella †coerulea Eaton, Man. ed. 7, 578. 1836; ed. 8, 469. 1840 = *V. locusta* (Linn.) Bettke.

The description is a reasonably ample one. It was based on a Maryland specimen received from Dr. Aikin as *Fedia coerulea* Aikin as indicated in the footnote. The "Index Kewensis" reference is "Eaton & Wright, N. Am. Bot. ed. VIII. 469 [1840]."

Verbena *bipinnatifida Nutt. in Jour. Acad. Nat. Sci. Phila. **2**: 123. 1821; Perry in Ann. Missouri Bot. Gard. **20**: 323. 1933.

Our attention was attracted to this through the entries in Eaton's "Manual," editions five (1829) to eight (1840), where the binomial is properly credited to Nuttall; the entry in "Index Kewensis" is to Schauer in DC. Prodr. **11**: 553. 1847. Nuttall's generic entry is "Verbena, (subgenus *Glandularia*.) Genus Glandularia, Gmelin", and under this is the entry "— Gl. **bipinnatifida*." Here the dash clearly indicates Nuttall's intention to publish this as a *Verbena*, not as a *Glandularia*; he did not publish the *Glandularia* combination until sixteen years later, as *G. †bipinnatifida* Nutt. in Trans. Am. Philos. Soc. II. **5**: 184. 1837.

***Vexillaria** Eaton, Man. 82. 1817; ed. 2, 488. 1818; ed. 3, 509. 1822; ed. 4, 498. 1824; ed. 5, 439. 1829; ed. 6, 386. 1833; ed. 7, 582. 836; ed. 8, 473. 1840 = *Clitoria* Linn.

The footnote in edition one is: "This name is given as a substitute of the 1712th genus of Persoon, which is so severely censured by Dr. Smith in Rees' Cyclopaedia." This is *Clitoria* Linn. Eaton's publication of *Vexillaria* antedates *Vexillaria* Raf. by one year, both being proposed as new names for *Clitoria* Linn.

Vexillaria *mariana Eaton, Man. 83. 1817; ed. 2, 489. 1818; ed. 3, 509. 1822; ed. 4, 498. 1824; ed. 5, 439. 1829; ed. 6, 386. 1833; ed. 7, 582. 1836; ed. 8, 473. 1840 = *Clitoria mariana* Linn.

No synonym is cited, but clearly *Clitoria mariana* Linn. was the basis of the name. Eaton's use of the binomial antedates that of Rafinesque by one year.

Vexillaria *plumieri Eaton, Man. ed. 5, 439. 1829; ed. 6, 386. 1833 (*plumiera*); ed. 7, 582. 1836 (*plumiera*); ed. 8, 473. 1840 (*plumiera*) = *Centrosema plumieri* (Turp.) Benth.

The authority is erroneously indicated as "P" = Persoon. No synonym is cited but *Clitoria plumieri* Turp. is clearly the basis of Eaton's binomial.

Vexillaria *virginiana Eaton, Man. 83. 1817; ed. 2, 488. 1818; ed. 3, 509. 1822; ed. 4, 498. 1824; ed. 5, 439. 1829; ed. 6, 386. 1833; ed. 7, 582. 1836; ed. 8, 473. 1840 = *Centrosema virginiana* (Linn.) Benth. (*Bradburya virginiana* O. Kuntze).

In edition five "W" = Willdenow is cited as the authority, but *Clitoria virginiana* of Willdenow is *C. virginiana* Linn. No synonym is cited by Eaton.

Viburnum *linus Eaton, Man. ed. 3. 509. 1822; ed. 4, 498. 1824; ed. 5, 440. 1829; ed. 6, 387. 1833; ed. 7, 583. 1836; ed. 8, 474. 1840, *sphalm.* = *V. tinus* Linn.

The entry in edition two, p. 489, is correct as *Viburnum tinus*.

Vicia *mitchilla Eaton, Man. 81. 1817; ed. 2, 491. 1818 = *Vicia mitchelli* Raf. (1814) = *V. hirsuta* (Linn.) S. F. Gray (1821); K. Koch (1837).

Regarding this Eaton says: "This species was found last summer by professor Mitchill of New York, and sent to the Italian naturalist, C. S. Rafinesque; who, discovering it to be a new species, gave it this specific name." Rafinesque, Précis Découv. Somiol. 37. 1814, says: "Cette plante m'a été comuniquée par le Doct. Mitchell de New York, ses semences sont édules; elle croit sur les bords de la mer en Connecticut, dans l'Isle longue, &c." Introduced from Europe and more or less naturalized.

Windsoria *seslerioides Eaton, Man. ed. 5, 447. 1829; ed. 6, 398. 1833; ed. 7, 593. 1836; ed. 8, 481. 1840 = *Triodia flava* (Linn.) Smyth (*Tridens flava* Hitchc.).

The authority is erroneously given as Michaux. The footnote entry is "poaeformis, N. Poa, Mx. quinquifida, Ph. flava, L. sub-verticillata, P," hence the basis of Eaton's name was *Poa seslerioides* Michx.

Xylosteum †solonis Eaton, Man. 26. 1817; ed. 2, 498. 1818; ed. 3, 518. 1822; ed. 4, 505. 1824; ed. 5, 449. 1829; ed. 6, 398. 1833; ed. 7, 595. 1836; ed. 8, 483. 1840 = *Lonicera villosa* R. & S. var. *solonis* (Eaton) Fernald in Rhodora **27**: 6. 1925.

The type was from New Hampshire, and later Eaton recorded it from Williamstown and Pittsfield, Massachusetts. One of these specimens is in book one of the Eaton herbarium at Yale University. The entry in "Index Kewensis" is *Xylosteon solonis* Eaton "Man. Bot. N. Am. ed. VI. 398 [1833], ed. VII. 518 [1836]."

Yucca *alnifolia Eaton, Man. ed. 5, 449. 1829; ed. 6, 399. 1833; ed. 7, 397. 1836; ed. 8, 484. 1840, *sphalm.* = *Yucca aloifolia* Linn.

The synonym cited in the footnote is "draconis, E", i.e., *Yucca draconis* sensu Ell. which is *Y. aloifolia* Linn.

APPENDIX A

An Overlooked Paper on Roripa.

[8] In scanning the literature appertaining to the genus *Rorippa* or *Roripa,* we located an apparently overlooked monographic treatment of the European species by Borbás, who used the form *Roripa;* at least many of the new binomials published by him in 1879 are either not listed in " Index Kewensis " and its nine supplements, or are entered as having been published by Borbás or other authors later than 1879. All of the new Borbás names in this paper appertain to European species. This paper forms part fifteen of volume nine of the " Értekezések a természettudományok köréböl," published by the Magyar Academy, Budapest **1** (1867)—**31** (1913); see " Union List of Periodicals " ed. 2, 1651. 1943. The author, title and reference is Borbás Vincze, " Floristicai adatok különös tekintettel a Roripákra " [Botanical contributions, with special reference to Roripa], in Értek. Termész. Köréböl **9** (15) : 1-64. 1879. This part contains two papers by Borbás, and the cover carries the statement " (Elöterjesztetett a III. osztáky. ülésén, 1879. ápril 21) ". The *Roripa* paper has its own title, " Ujabb adatok a hazai Roripák ismertetéséhez," and occupies pages 10 to 64 of this part. The introduction is in Hungarian, the ample keys, descriptions and discussions in Latin. Examination of this paper led us to one published a year earlier by Borbás entitled " Arabisek és egyéb cruciferák körül " which contains certain *Roripa* transfers. This paper appeared in volume fifteen of the " Mathematikai és természettu dományi Közlemények vonatkozólag a hazai viszonyorka," 1878. It is the volume for 1877-78, but all the signatures are dated 1878. References to this earlier paper are added in this note.

__Rorip[p]a †anceps__ Reichb., Ic. Fl. Germ. __2__: 15. 1837-38. This replaces the later Fuss transfer, Fl. Transillv. (1866).

_R._ __*astylis__ Reichb. l. c.

_R._ __†capillipes__ Borbás, in Értek. Termész. Köréböl __9__(15) : 16, 19, 28, _descr. in clavis_, 31, _descr._, 1879. This replaces the later Simonkai name, Enum. F. Transsilv. (1886).

_R._ __*danubialis__ Borbás, Mathemat. Termész. Kozlem. __15__: 185. 1878, _nom._; Értek. Termész. Köréböl __9__(15) : 20, 30, _descr. in clavis_, 64, _descr._, 1879.

_R._ __†erythrocaulis__ Borbás, in Értek. Termész. Köréböl __9__(15) : 15, 20, 29, _descr. in clavis_, 62, _descr._, 63, _descr._, 1879. This replaces the later Borbás ex Nym., Enum. Fl. Transsilv. (1889) record.

_R._ __*haynaldiana__ Borbás, _op. cit._ 18, 24, _descr. in clavis_, 37, 49, _descr._, 51. 1879.

_R._ __†hungarica__ Borbás, in Mathemat. Termész. Kozlem. __15__: 186. 197. 1878; Értek. Termész. Köréböl __9__(15) : 14, 16, 18, 23, _descr. in clavis_, 54, _descr._, 1879. This replaces the later Borbás ex Nym., Consp. Fl. Eur. (1889) record.

_R._ __*hybrida__ Borbás, in Értek. Termész. Köréböl __9__(15) : 14, 16, 18, 23, _descr. in clavis_, 48, 54, _descr._, 1879.

_R._ __*lyrata__ Borbáz, _op. cit._ 40, 49. 1879 (_Armoracia *lyrata_ Scheele, Flora __26__(1) : 307. 1843). This was the entry that led us to the unlisted _Brachylobus_ names of Schur which are appended to this note, and further the location of the hitherto unlisted Scheele binomial.

_R._ __†morisoni__ Borbás, in Mathemat. Termész. Kozlem. __15__: 186. 1878; Értek. Termész. Köréböl __9__(15) : 16, 19, 27, _descr. in clavis._, 1879. This replaces G. Beck's later transfer of the same name, Fl. Nied.-Oester. (1902).

R. †**neogradensis** Borbás, *op. cit.*, 186, 199. 1878; 16, 18, 22, *descr. in clavis.*, 1879. This replaces the later Borbás ex Nym., Consp. Fl. Eur. (1889) record.

R. ***permixta** Borbás, in Értek. Termész. Köréböl **9**(15): 17, 19, 28, *descr. in clavis*, 30, *descr.*, 1879.

R. ***pinnatifida** Borbás, *op. cit.*, 48, 49, *descr.*, 51. 1879.

R. †**prolifera** Borbás, in Mathem. Termész. Kozlem. **15**: 185. 186. 1878; Értek. Termész. Köréböl **9**(15): 14, 15, 20, 30, *descr. in clavis*, 43, 63, *descr.*, 1879. This replaces the later Simonkai, Enum. Fl. Transsilv. (1886), transfer.

R. ***quadrivalvis** Borbás, in Értek. Termész. Köréböl **9**(15): 11, 18, 21, *descr. in clavis.*, 1879.

R. †**reichenbachii** Borbás, *op. cit.* 16, 19, 28, 31, 41, 42, 61, *descr.*, 1879. This replaces the later transfer by Simonkai, Enum. Fl. Transsilv. (1886).

R. ***repens** Borbás, in Mathem. Termész. Kozlem. **15**: 185. 1878; Értek. Termész. Köréböl **9**(15): 11, 12, 15, 19, 25, 29, *descr. in clavis*, 40, 49. 1879.

R. †**silvestris** Reichb., Ic. Pl. Germ. **2**: 15. 1837-38. This replaces the later transfer by Fuss, Fl. Transsilv. (1866).

R. ***sonderi** Borbás, in Értek. Termész. Köréböl **9**(15): 18, 21, *descr. in clavis.*, 1879.

R. †**stenophylla** Borbás, *op. cit.* 17, 21, *descr. in clavis*, 58, *descr.*, 1879. This replaces the later Borbás ex Nym. Consp. Fl. Eur. (1889) record.

R. ***subamphibia** Borbás, *op. cit.* 54, *nomen, in syn.*, 1879.

R. †**subglobosa** Borbás, in Mathem. Termész. Kozlem. **15**: 186. 193. 200. 1878; Értek. Termész. Köréböl **9**(15): 19, 24, *descr. in clavis*, 49, *descr.*, 1879. On page 49 the author gives a reference to his earlier paper of 1878. This replaces the later Borbás ex Nym., Consp. Fl. Eur. (1889) record.

R. †**thracica** Borbás, in Értek. Termész. Köréböl **9**(15): 21, *descr. in clavis*, 60. 1879. This replaces the later Fritsch transfer, Verh. Zool.-Bot. Ges. Wien **44**: 317. 1895.

R. †**turczaninowii** Borbás, *op. cit.* 19, 25, *descr. in clavis*, 52, *descr.*,1879. This replaces Simonkai's later transfer, Enum. Fl. Transsilv. (1886).

Certain references in this Borbás paper led us to earlier works, the net results being the location of three unlisted Reichenbach transfers to *Roripa* (1837-38), and ten transfers by Schur (1866) to *Brachylobus*, none listed in any standard index. It was the entry "*Roripa* (*Brachylobus*) *hybrida* (Schur)" that led us to examine Schur's "Enumeratio Plantarum Transsilvaniae" (1866) where he raised *Nasturtium*, section *Brachylobus* DC. to generic rank and transferred ten species to it. The three Reichenbach early transfers to *Roripa* are included in the above list; the ten Schur names, all synonyms of various species of *Rorippa* are: *Brachylobus* ***amphibius** Schur, Enum. Pl. Transsilv. 40, 1866; ***anceps** Schur, l.c.; ***armoracoides** Schur l.c.; ***austriacus** Schur, op. cit. 41: ***brevistylis** Schur, op. cit. 39; ***hybridus** Schur, op. cit. 40; ***palustris** Schur, op. cit. 39; ***pyrenaicus** Schur. l.c.; ***riparius** Schur, op. cit. 40; ***sylvestris** Schur, op. cit. 39. We suspect that there may be a large number of unlisted new binomials in Schur's work.

Otway H. Brown

W. M. Benner and F. W. Pennell

Otway H. Brown, who died at his home at Cold Spring near Cape May, New Jersey, on October 31, 1946, was for more than 38 years a Corresponding Member of the Philadelphia Botanical Club. He lived all his life in southern New Jersey, and knew the plants and animals of the Cape May district with remarkable intimacy.

Born April 23, 1877, he attended only local schools, which in those days offered merely grammar grades. Early in life he developed an interest in nature, especially in botany. On occasional visits to Philadelphia he bought botanical books. It was from these books and from the plants at hand that he obtained his education in our science. Long winter evenings would be spent in study and in work on his herbarium.

Mr. Brown's business, that of gardener and florist, was congenial to this interest. In later life he worked in other and less attractive pursuits, but during this past year he was appointed Curator of the newly formed Cape May Geographic Society. His friends were hoping that this would develop into a worthy outlet for his talents.

Mr. Brown's association with the botanists of the Academy of Natural Sciences of Philadelphia dates from the first decade of this century, the period when Stewardson Brown, Samuel S. Van Pelt, Charles S. Williamson, Bayard Long, and especially Witmer Stone, made trip after trip to the Pine Barrens and coastal portions of southern New Jersey. When Cape May County was visited, the trips were often under the guidance of Otway Brown. On October 22, 1908 he was made a Corresponding Member of the Philadelphia Botanical Club, and early numbers of Bartonia contain many references to significant collections by him. In the " Plants of Southern New Jersey ", published in 1911, Dr. Stone expresses his indebtedness to Brown, and states that the latter's herbarium then included some 2,500 specimens from Cape May County.

At Cape May there lived also H. Walker Hand, an enthusiastic observer and collector of birds, and with this older man Brown was happily associated for many years. The younger man had a wider interest, for we find him collecting both plants and animals, even gathering cold-blooded vertebrates for Mr. H. W. Fowler of the Philadelphia Academy. (One of these, a beautiful little fish named *Antigonia otwayi* by Fowler, perpetuates Otway Brown's name in science.) Above all, both Hand and Brown were most hospitable to visiting naturalists, and many such made the home of Mr. and Mrs. Brown their basis for scientific work in the Cape May peninsula.

To none was Otway Brown's hospitality and the practical aid of his car given more freely than to Witmer Stone, who for many years spent his summers and later his entire years at Cape May. Both men were naturalists in a broad sense. They were together for fourteen Christmas seasons, and then cooperated in each Christmas bird census. Both had herbaria, and both were keenly alert to problems of local distribution of plants and animals. Brown's zeal turned to the preparation of a detailed catalogue that he entitled " Plants of Cape May County, New Jersey, collected from 1893 to 1931 ", though one suspects that the closing date should be moved forward to 1946. For each entity it gives habitat, local occurrence, and flowering season. Just before his death this catalogue was brought to Philadelphia, and a special committee of the Philadelphia Botanical Club is considering the possibility of its publication.

Mr. Brown's herbarium grew not only by his own local collecting but also by exchange with many correspondents over the World. His local finds were at all times generously shared with the Local Herbarium of the Academy of Natural Sciences, but the more distant and foreign acquisitions must contain many collections, and even species, not represented at that institution. Because of the wealth of both series we deeply appreciate Mrs. Brown's willingness to have this considerable herbarium come to our Academy.

Cape May has been fortunate in having so keen and generous-spirited a student of its flora and fauna. Otway Brown will be widely and deeply missed.

Program of Meetings during 1945

Date	*Subject*	*Speaker*	*Attendance*
Jan. 25	Rambling in the Colorado Rockies	Raymond Gregg	28
Feb. 22	Flowers of northern British Columbia	Mrs. J. Norman Henry	31
Mar. 22	Toadstools to Orchids	Richard B. Chillas	24
Apr. 26	The Genus Pedicularis—American species	Francis W. Pennell	
	—Chinese species	Hui-Lin Li	32
May 24	Polemoniaceae	Edgar T. Wherry	50
Sept. 27	Plants of the Central Colorado Rockies	John Austin Jump	27
Oct. 25	Present Conditions in Chinese Botanical Research	Hui-Lin Li	
	Orchids and others Flowers in my Chinese Garden	William W. Cadbury	32
Nov. 29	Moss Collecting in Sullivan County, Pennsylvania	Leslie D. Stair	
	A Method for preserving Natural Color of Flowering Specimens	G. R. Fessenden	35
Dec. 20	Twenty-five Years of Botanizing throughout the United States	Edgar T. Wherry	25

List of Officers and Members, 1945

Francis W. Pennell, *President*
Mrs. J. Norman Henry, *Vice-President*
Walter M. Benner, *Secretary*
Lee Sowden, *Treasurer*
Bayard Long, *Curator*
Francis W. Pennell, *Editor of* BARTONIA

ACTIVE MEMBERS

(as of December 1, 1946)

	Elected
J. W. Adams, 32 Pleasant St., Philadelphia 19, Pa.	1925
Walter Ainsworth, 3202 Hamilton St., Philadelphia 4, Pa.	1946
D. Curry Armstrong, 124 Bridge St., Morton, Pa.	1946
Mrs. A. C. Barnes, Latch's Lane, Merion, Pa.	1942
Edwin B. Bartram, Bushkill, Pa.	1906
J. Russel Bebler, 135 E. Phil Ellena St., Philadelphia 19, Pa.	1919
Mrs. Louis P. Bell (Léonie Hagerty), 6612 Germantown Ave., Philadelphia 19, Pa.	1944
Dr. Walter M. Benner, 5636 Loretta Ave., Philadelphia 24, Pa.	1912
Jasper T. Bentley, 7334 Rural Lane, Philadelphia 19, Pa.	1933
Dr. David Berkheimer, 518 Elm St., Reading, Pa.	1943
Carl E. Bliss, 76 N. Grove St., East Aurora, N. Y.	1924
Miss Ruth Boyer, Academy of Natural Sciences, Philadelphia 3, Pa.	1946
John Bright, 511 Cheltena Ave., Jenkintown, Pa.	1943
Miss Ethel Brubaker, "The Fairfax," 43rd & Locust Sts., Philadelphia 4, Pa.	1939
William C. Brumbach, Esterly, Pa.	1943
Miss Marie Chillas, 233 Winona Ave., Philadelphia 44, Pa.	1941
Richard B. Chillas, 233 Winona Ave., Philadelphia 44, Pa.	1942
Prof. M. A. Chrysler, Chaplin, Conn.	1931
F. Van Buren Connell, "Hollybrook", Brookside Ave., Wayne, Pa.	1924
J. S. Coryell, School of Horticulture, Ambler, Pa.	1946
W. L. Dix, 801 Crown St., Morrisville, Pa.	1942
D. E. Dimmick, 183 State St., East Stroudsburg, Pa.	1946
Robert T. Dreisbach, 301 Helen St., Midland, Mich.	1922
Miss Elizabeth C. Earle, 4209 Chester Ave., Philadelphia 4, Pa.	1935
Howard W. Elkinton, 6514 Germantown Ave., Philadelphia 19, Pa.	1931
Mrs. Nellie Erisman, 1821 Mt. Vernon St., Philadelphia 30, Pa.	1945
Mrs. Harold Evans, "Awbury", E. Washington Lane, Philadelphia 38, Pa.	1931
Richard Blossom Farley, "Sarobia", Eddington, Pa.	1931
G. R. Fessenden, Wyeth Institute of Biochemistry, 900 N. Broad St., Philadelphia 30, Pa.	1945
Miss Elizabeth H. Flavell, 142 W. Chelten Ave., Philadelphia 44, Pa.	1946
Dr. John M. Fogg, Jr., University of Pennsylvania, Philadelphia 4, Pa.	1921
Fairman R. Furness, Media, Pa.	1935
Miss Elizabeth A. Gest, R. D. 1, Telford, Pa.	1944
John Gill, 2 Linden Ave., Haddonfield, N. J.	1939
Mrs. John Gilpin, Sugar Loaf Orchard, Chestnut Hill, Philadelphia 18, Pa.	1943
Dr. Thomas S. Githens, Cambridge Apartments, School Lane and Wissahickon Ave., Philadelphia 44, Pa.	1945
Dr. Robert B. Gordon, 415 Sharpless St., West Chester, Pa.	1942
Dr. H. K. Groff, 18 S. Duke St., Lancaster, Pa.	1946
Dr. Theodore P. Haas, Philadelphia College of Pharmacy and Science, Philadelphia 4, Pa.	1946
Louis E. Hand, 8061 Fairview St., Philadelphia 36, Pa.	1936
Miss Ann Harbison, "The Barclay," 18th St. and Rittenhouse Square, Philadelphia 3, Pa.	1944

Arthur M. Henry, 416 New Post Office, Atlanta, Ga. 1927
Howard K. Henry, 1464 Drayton Lane, Philadelphia 31, Pa. 1932
Mrs. J. Norman Henry, Gladwyne, Pa. 1932
Miss Josephine de N. Henry, Gladwyne, Pa. 1938
Miss L. K. Herring, 444 Queen Lane, Philadelphia 44, Pa. 1942
Lee P. Hynes, 36 West End Ave., Haddonfield, N. J. 1939
Miss Nancy E. James, 4043 Baltimore Ave., Philadelphia 4, Pa. 1942
Charles F. Jenkins, Kitchens Lane, Philadelphia 19, Pa. 1934
Prof. Marion A. Johnson, Dept. of Botany, Rutgers University, New Brunswick, N. J. . 1946
Miss Natalie B. Kimber, 538 E. Locust Ave., Philadelphia 44, Pa. 1928
Rev. William U. Kistler, 118 Main St., Pennsburg, Pa. 1911
Charles E. Knopf, 7161 Georgian Road, Philadelphia 38, Pa. 1931
Dr. Henry A. Laessle, 5900 Market St., Philadelphia 39, Pa. 1894
Mrs. Ida K. Langman, 2316 Delancy Place, Philadelphia 3, Pa. 1937
Morris E. Leeds, 1025 Westview St., Philadelphia 19, Pa. ....Founder
Dr. Harry A. Lloyd, 200 N. 35th St., Philadelphia 4, Pa. 1931
Bayard Long, 250 Ashbourne Road, Elkins Park, Philadelphia 17, Pa. 1906
John R. McIntosh, 304 Winona Ave., Philadelphia 44, Pa. 1945
Miss Marie A. Mealey, 1126 W. Fourth St., Wilmington, Del. 1946
Edwin T. Moul, Dept. of Botany, University of Pennsylvania, Philadelphia 4, Pa. 1945
Mrs. George B. Orr, "Orchard Way", Berwyn, Pa. 1935
Miss Elizabeth G. Ostheimer, Jenkintown, Pa. 1933
Dr. Samuel C. Palmer, 26th and Chestnut Sts., Chester, Pa. 1929
Dr. Ruth Patrick, Academy of Natural Sciences, Philadelphia 3, Pa. 1937
Dr. Francis W. Pennell, Moylan, Pa. 1910
Mrs. Venia T. Phillips, Secane, Pa. 1944
Richard W. Pohl, Dept. of Botany, University of Pennsylvania, Philadelphia 4, Pa. 1940
Harold W. Pretz, 123 S. 17th St., Allentown, Pa. 1909
George R. Proctor, Old Mill Road, Greenville, Del. 1944
Miss Helen Ramsay, 1328 Jerome St., Philadelphia 40, Pa. 1945
Mrs. Karl Rugart, 612 Bryn Mawr Ave., Penn Valley, Narberth, Pa. 1942
Robert L. Schaeffer, Jr., 32 N. 8th St., Allentown, Pa. 1938
Dr. J. R. Schramm, Dept. of Botany, University of Pennsylvania, Philadelphia 4, Pa. ... 1937
Henry Skinner, Morris Arboretum, Chestnut Hill, Philadelphia 18, Pa. 1942
Lee Sowden, 3823 Oak Road, Philadelphia 29, Pa. 1901
Leslie D. Stair, 141 Fern Ave., Collingswood, N. J. 1944
Dr. Walter Steckbeck, Dept of Botany, University of Pennsylvania, Philadelphia 4, Pa. 1925
Dr. C. I. Stiteler, 507 Welsh St., Chester, Pa. 1945
Hugh E. Stone, 431 Berkley Road, Haverford, Pa. 1892
Dr. Robert R. Tatnall, 1100 W. Tenth St., Wilmington, Del. 1928
Horace E. Thompson, 5016 Schuyler St., Philadelphia 44, Pa. 1920
Wm. Thompson, Jr., Leroy Court Apts. # 403, 1700 S. 60th St., Philadelphia 42, Pa. 1936
R. J. Titherington, 6317 N. Norwood St., Philadelphia 38, Pa. 1942
Harry W. Trudell, 303 Highland Ave., Abington, Pa. 1915
Dr. Paul R. Wagner, Ursinus College, Collegeville, Pa. 1935
Warren H. Wagner, 7708 N.W. Morningside Drive, Washington, D. C. 1942
E. Perot Walker, 511 Lynmere Road, Bryn Mawr, Pa. 1939
Mrs. Marguerite L. Warnke, 142 S. Logan Ave., Audubon, N. J. 1935
Robert F. Welsh, 325 Chestnut St., Philadelphia 6, Pa. 1909
Dr. Edgar T. Wherry, Dept. of Botany, University of Pennsylvania, Philadelphia 4, Pa. 1925

Hans Wilkens, 424 S. 15th St., Reading, Pa.	1928
William H. Witte, Riegelsville, Pa., R. D.	1898
Carroll E. Wood, Jr., 434 High St., Salem, Va.	1942
Howard Wood, Jr., "Aloha," R. D. 1, Conshohocken, Pa.	1944
Miss Mary F. Wright, 231 Winona Ave., Philadelphia 44, Pa.	1928

HONORARY MEMBERS

Charles M. B. Cadwalader, Academy of Natural Sciences, Philadelphia 3, Pa.	1944
Dr. Joseph S. Illick, State College of Forestry, Syracuse, N. Y.	1925
Dr. Edward E. Wildman, 4331 Osage Ave., Philadelphia 4, Pa.	1931

CORRESPONDING MEMBERS

Dr. John H. Barnhart, New York Botanical Garden, New York, N. Y.	1936
Prof. M. L. Fernald, Gray Herbarium, Harvard University, Cambridge, Mass.	1929
Dr. Hui-Lin Li, Soochow University, Soochow, Kiangsu, China	1944
Dr. Elmer D. Merrill, Arnold Arboretum, Jamaica Plain 30, Mass.	1945
Dr. Harold St. John, University of Hawaii, Honolulu, T. H.	1927
Dr. William Randolph Taylor, University of Michigan, Ann Arbor, Mich.	1921
Dr. Campbell E. Waters, Chevy Chase, Washington, D. C.	1904
Dr. Heber W. Youngken, Massachusetts College of Pharmacy, Boston, Mass.	1918

RECENTLY DECEASED MEMBERS

	Died
Otway H. Brown, Corresponding	Oct. 31, 1946
F. F. Huber, Active	Nov. 28, 1946
Prof. W. A. Kline, Active	Nov. 20, 1946

Index to Species

(Names of new entities in **bold-face** type; of synonyms in *italic* type.)

Acacia brachyloba, 65; *cooleyi*, 50
Acerates ivesii, 50; *lanceolata*, 50; *monocephala*, 50; *nuttalliana*, 50; *obovata*, 50; *viridiflora*, 50
Achillea borealis, 20; millefolium, 20
Achyranthes vermicularis, 51
Adicea (“*Adesia*”) *trinerva*, 51
Aegilops triuncialis, 23
Aesculus *macrostachya* (“*monostachya*”), 51; parviflora, 51
Agrostis alaskana, 14; *longifolia*, 51; perennans, 75
Alectorolophus arcticus, 19; *borealis*, 19
Allionia multiflora, 51
Alnus crispa sinuata, 16; rubra, 16
Alopecurus aequalis, 14; rendlei, 24; *utriculatus*, 24
Alsine longifolia, 65
Amaryllis atamasco, 51
Amellus spinulosus, 74
Ammi majus, 73
Ammophila breviligulata, 24
Amphicarpaea bracteata, 68; *monoica*, 68; pitcheri, 68
Amyrsine buxifolia, 64
Anacharis canadensis, 73
Anaphalis margaritacea occidentalis, 20
Andrewsia paniculata, 52
Antennaria margaritacea, 20
Antirrhinum orontium, 51; triornithophorum (“*trianthophorum*”), 51
Anychia argyrocoma, 70; *hernarioides*, 70
Anychiastrum hernarioides, 70
Apargia orontium, 51
Aplectrum hyemale, 56
Aplopappus spinulosus, 74
Aquilegia formosa, 16
Arabis *hastata*, 28, 51-52; hirsuta eschscholtziana, 17; laevigata, 51; lyrata, 73
Arbutus filiformis, 60; *thymifolius*, 60
Ardisia escallonioides, 68
Arenaria peploides, 16
Arethusa *plicata*, 61; reflexa, 61
Armoracia aquatica, 56; *lyrata*, 78
Arnica latifolia, 20
Arrhenatherum elatius biaristatus, 24
Artemisia absinthium (“*absynthium*”), 52; *douglassiana* (“*douglassii*”), 52; ludoviciana, 52
Arum sagittifolium, 52; *walteri*, 52
Aruncus sylvester, 17
Arundinaria japonica, 22
Arundo canadensis, 52; *cinnoides* (“*conoides*”), 52; *coarctata*, 53; *stricta*, 53
Asclepias *lanceolata*, 50; *nuttalliana*, 50; obovata, 50; viridiflora, 50
Aspidium atomarium, 49; *bulbiferum*, 49; *obtusum*, 49, 50; *punctilobulum*, 49; *punctilobum*, 49; *rufidulum*, 49; *tenus*, 49
Aster foliaceus, 20; peregrinus, 20
Astragalus lotiflorus, 67; *triphyllus*, 67
Athyrium *atomarium*, 49; *bulbiferum*, 49; filix-femina cyclosorum, 14; *punctilobum*, 49; *rufidulum*, 49; *tenue*, 49
Atragene americana, 55
Atriplex gmelini, 16

Bacopa monnieri, 62
Baptisia australis, 52; *coerulea*, 52
Barkhausia (“*Borkhausia*”) *grandiflora*, 53
Bartonia nuda, 75; ornata, 75; paniculata, 52; *tenella*, 52
Batophaca lotiflora, 67
Besseya bullii, 46, 61
Bignonia crucigera (“*crucifera*”), 52
Blephilia *beckii*, 66; ciliata, 65, 66; hirsuta, 65
Bonatea ichnumonea, 61; membranacea, 61; procera, 61
Bouteloua curtipendula, 55
Brachylobus amphibius, 79; *anceps*, 79; *armoracoides*, 79; *austriacus*, 79; *brevistylis*, 79; *hybridus*, 79; *palustris*, 79; *pyrenaicus*, 79; *riparius*, 79; *sylvestris*, 79
Brachyris sarothrae, 53
Bradburya virginiana, 77
Bunias edentula (“*edentata*”), 53

Cakile edentula, 53; e. californica, 17; maritima, 53
Caladium glaucum, 28, 53

Calamagrostis canadensis, 52; c. langsdorffii, 14; cinnoides, 52, 53; *coarctata*, 53; *langsdorffii*, 14; neglecta, 14
Caltha palustris asarifolia, 16
Calystegia catesbeiana, 56
Campanula amplexicaulis, 74
Capsella bursa-pastoris, 17
Carduus foliosus, 55; *pitcheri*, 55; *remotifolius*, 56; *undulatus*, 56
Carex brunnescens, 15; canescens, 15; capillaris, 15; *carltonia* ("*carltoniana*"), 53; concolor, 54; *decidua*, 15; *deweyana* ("*deweyi*"), 53; festiva *pachystachya*, 15; flava, 15; garberi bifaria, 15; gmelini, 15; halseyana ("*halseyi*"), 53; heleonastes, 53; hindsii, 15; hitchcockiana ("*hitchcockii*"), 53; limosa *stygia*, 15; macloviana pachystachya, 15; macrocephala anthericoides, 15; mertensii, 15; oederi viridula, 15; *okesiana* ("*oakesii*", "*okesii*"), 54; oligosperma, 54; phyllomanica, 15; physocarpa, 15; pluriflora, 15; polymorpha, 53; schweinitzii ("*schweinitzia*"), 54; *washingtoniana* ("*washingtonia*"), 54
Carya ovata, 54, 63; *squamosa*, 54
Cassiope stelleriana, 18
Castilleja miniata, 19; unalaschcensis, 19
Caulinia fragilis, 60
Centaurella autumnalis, 52; *paniculata*, 52
Centrosema plumieri, 77; virginiana, 77
Cerastium caespitosum, 16; dichotomum, 54
Cerasus cerasus, 54; *emarginata*, 69; *littoralis*, 54; *umbellata*, 54
Chaerophyllum *claytoni*, 66; *procumbens*, 76
Cheirinia cheiranthoides, 73
Chiogenes hispidula, 60
Chironia stellata ("*stellaris*"), 54; *venosa*, 55
Chloris secundus, 55
Chrysocoma solidaginoides, 55
Chrysocoptis ("*Chrysocopsis*"), 55
Chrysoma pauciflosculosa, 55; *solidaginoides*, 55
Chrysosplenium tetrandrum, 17
Cimicifuga americana, 64; *cordifolia*, 64; elata, 64; foetida, 64; palmata, 65; *podocarpa*, 65; racemosa, 65; *serpentaria*, 65
Cinnamomum camphora, 63
Circaea alpina, 18
Cirsium pitcheri, 55; undulatum, 56
Citrus limetta ("*limella*"), 55
Claytonia caroliniana, 55; *spatulata*, 55
Clematis *hexagona*, 55; verticillaris, 55; virginiana ("*virginica*"), 55
Cleome erosa, 55
Clintonia borealis, 56; *umbellulata*, 56
Clitoria mariana, 77; *plumieri*, 77; *virginiana*, 77
Cnicus foliosus, 55; *pitcheri*, 55; *remotifolius*, 55; *undulatus*, 56
Cochlearia *aquatica*, 56; *groenlandica* ("*greenlandica*"), 56; officinalis, 56; o. oblongifolia, 17
Coelopleurum gmelini, 18
Conioselinum gmelini, 18
Convallaria umbellata, 56; *umbellulata*, 56
Convolvulus catesbeianus ("*catesbyanus*"), 56
Coptis asplenifolia, 16; groenlandica, 62; trifolia, 16, 62
Corallorrhiza *hyemalis*, 56; mertensiana, 16
Cornucopia perennans, 75
Cornus canadensis, 18
Coronilla emerus ("*omerus*"), 56
Corydalis *rosea*, 56; sempervirens, 56
Corynephorus canescens, 23
Crataegus flexuosa, 56-57; *platycarpa*, 56
Cristatella *erosa*, 55; jamesii, 55
Crotalaria *flexuosa*, 56; *platycarpa*, 56; sagittalis, 56
Cryptotaenia canadensis, 76
Cubelium concolor, 63
Cucubalus douglassii, 57; *niveus* ("*nivens*"), 57
Cymbidium antenniferum, 61; *hyemale*, 56; monanthos, 61
Cynosurus secundus, 55
Cynthia dandelion, 63; *griffithii*, 63; *lyrata*, 63; virginica, 63
Cyperus *aestuarius*, 57; *caespitosus*, 57; diandrus, 57; dubius, 57; filicinus, 57; filiculmis macilentus, 57; *killingaeoides*, 57; *nuttallii*, 57
Cystopteris bulbifera, 49; fragilis, 14, 49; *tenuis*, 49

Dactylis glomerata, 64
Dalea ornata, 57
Decumaria alata, 57-58
Delesseria alata, 57-58
Dendrium buxifolium, 64
Dendrobium grandiflorum, 61
Dennstaedtia punctilobula, 49

Descurainia richardii, 74
Desmanthus *branchylobus*, 65; *cooleyi*, 46, 50; illinoensis, 65; *jamesii*, 50
Desmodium canescens, 62
Deweya canadensis, 58
Digitaria vulgaris, 61
Dioscorea glauca, 58
Dodecatheon frigidum, 21; *meadia pauciflorum*, 21; pauciflorum, 21; **superbum**, 18, 20-21
Dolichos phaseolus, 58
Donia pubescens, 58
Draba borealis, 58; *incana*, 58; *unalaschkiana* ("*unalaschiana*"), 58
Drosera rotundifolia, 17
Dryopteris austriaca, 14; linneana, 14; spinulosa, 14

Eatonia, 58
Echinopanax horridum, 11, 12, 18
Eleocharis calva, 72; parvula, 72; tenuis, 72
Elodea canadensis, 73
Elymus arenarius mollis, 14; hirsutus, 15
Empetrum nigrum, 17
Epidendrum antenniferum, 61; *grandiflorum*, 61
Epilobium angustifolium, 18; behringianum, 18; bongardi, 18; hornemanni, 18; latifolium, 18
Epipactis reflexa, 61
Equisetum arvense, 14; variegatum alaskanum, 14
Eragrostis cilianensis, 69
Erigenia bulbosa, 62
Erigeron salsuginosus, 20
Eriophorum angustifolium scabriusculum, 15; scheuchzeri, 15; vaginatum ("*virginatum*"), 58; virginicum, 58, 76
Erysimum *amphibium*, 59; cheiranthoides, 73; *nasturtium*, 59; *palustre*, 59; *parviflorum*, 73; *tanacetaefolium*, 59; *vulgare*, 59; *walteri*, 59
Esula corollata, 59; *lathyrus*, 59; *mercurialina*, 59
Euosmus albida, 63
Eupatorium altissimum, 59; fistulosum, 60; *gracile*, 59, 60; purpureum angustifolium, 60
Euphorbia corollata, 59; lathyrus, 59; mercurialina, 59
Evolvulus nummularius ("*nummularis*"), 60

Fedia coerulea, 60, 76
Festuca obtusa, 69; rubra, 15; *sciurea*, 22
Fimbristylis puberulus, 72
Fluvialis fragilis, 60
Fragaria chiloensis, 17
Fuirena scirpoidea, 76; squarrosa ("*squamosa*"), 60

Galactia villosa, 60
Galardia fimbriata, 64
Galega paucifolia, 60
Gastronychia hernarioides, 70
Gaultheria hispidula, 60; *serpillifolia*, 60
Geum calthifolium, 17; macrophyllum, 17
Glandularia bipinnatifida, 76
Glaux maritima, 18
Glechoma *cordata*, 61; hederacea, 61
Glehnia leiocarpa, 18
Glyceria borealis, 22; pauciflora, 15
Glycine frutescens, 68; *helvola* ("*helvata*"), 61; *tomentosa volubilis*, 67
Gomphrena brasiliensis, 51; *vermicularis*, 51
Gordonia alatamaha, 61; *franklinia*, 61; *franklinii*, 61
Gratiola *monnieri*, 62; neglecta, 61; *pubescens*, 61
Grindelia inuloides, 58; *pubescens*, 58
Gutierrezia *euthamiae*, 53; sarothrae, 53
Gymnandra bullii, 61

Habenaria *dilatata*, 16; flava, 61; foliosa, 61; *fuscescens*, 61; humilis, 61; *hyperborea*, 16; japonica, 61; koenigii, 61; *michauxii*, 62; psychodes, 61; quinqueseta, 61; *simpsonii*, 62
Haplopappus spinulosus, 74
Haynaldia villosa, 23
Hedysarum aikinii, 62; *viridiflorum*, 62
Helenium vernale, 64
Helianthus ballii, 47, 62; decapetalus, 62
Helleborus trifolius ("*trifoliatus*"), 62
Hemianthus micranthus, 62
Heracleum *lanatum*, 18; maximum, 18
Herpestis brownei, 62; *micrantha*, 62
Hesperaster, 75
Heteranthera limosa, 62; *ovalis*, 62
Hierochloe odorata, 15, 24
Hippuris vulgaris, 18
Hoffmannia obovata, 61; verticillata, 61
Holcus mollis, 24
Honckenya peploides major, 16

Hordeum brachyantherum, 15; gussoneanum, 23; jubatum, 15; murinum, 23; pusillum, 23
Hosackia americana, 76
Hybanthus concolor, 63
Hydnum chrysorhizum, 29
Hydrastis carolinensis, 65
Hydrocharis *cordifolia*, 62; spongia ("*spongiosa*"), 62
Hydrocotyle bulbosa, 62
Hypnum cooleyanum, 29
Hypopeltis obtusa, 49
Hypopithys americana, 66; *lanuginosa*, 66

Ilex *canadensis*, 58; cassine, 63; *dahoon* ("*dakoon*"), 63
Illecebrum vermiculatum, 51
Ionidium concolor, 63
Iris setosa, 16
Isnardia ascendens, 63

Juglans compressa, 54; *squamosa* ("*squarrosa*"), 54, 63
Juncoides campestre sudeticum, 15
Juncus alpinus nodulosus, 15; bufonius, 15; falcatus *alaskensis*, 15; f. sitchensis, 15; mertensianus, 15; triglumis, 15

Krigia griffithii, 63; *lyrata*, 63

Lathyrus *albidus*, 63; *maritimus*, 17; ochroleucus, 63; palustris, 17, 63; *stipulaceus*, 63
Laurus albida, 63; *camphora* ("*camphorata*"), 63
Lavandula *spica* ("*spicata*"), 64; vera, 64
Ledum thymifolium, 64
Leiophyllum buxifolium, 64; *thymifolium*, 64
Leptanthus ovalis, 62
Leptopoda fimbriata, 64
Ligusticum hultenii, 18; scothicum, 18
Lilium canadense, 3, 5, 7; c. *coccineum*, 7; c. editorum, 5, 7, 8; c. *flavum*, 7; *carolinianum*, 8; catesbaei, 5, 6, 8; c. **asprellum**, 5, 6; c. longii, 5, 6; grayi, 5, 7; **iridollae**, 2-4, 6, 8; *lanceolatum*, 7; *masseyi*, 7; michauxii, 3, 6, 8; michiganense, 4, 6, 7, 8; m. *umbelliferum*, 8; *m. uniflorum*, 8; *montanum*, 7; *peramoenum*, 8; philadelphicum, 5, 6 (with forma **masseyi**, 7); p. andinum, 5, 7 (with formas **lanceolatum** and **montanum**); p. *montanum*, 7; p. *pulchrum*, 7; superbum, 3, 6, 7, 8; s. *carolinianum*, 8
Limnetis glomerata, 64
Lindernia dubia major, 62
Listera caurina, 16; cordata nephrophylla, 16
Lonicera hirsuta, 34, 64; *pubescens*, 34; villosa solonis, 46, 77
Lotus sericeus, 76
Lupinus nootkatensis, 17; n. *unalaskensis*, 17; polyphyllus, 17
Luzula multiflora, 15; parviflora divaricata, 15
Lycopodium annotinum, 14; L. a. pungens, 14; selago ("*celago*"), 50
Lysichiton americanum, 15
Lysimachia thyrsiflora ("*thyrsifolia*"), 64

Macrotys cordifolia, 64; *foetida*, 64; *palmata*, 64; *podocarpa*, 65; *racemosa*, 65; *serpentaria*, 65
Majanthemum dilatatum, 15
Malaxis ophioglossoides, 65
Matricaria suaveolens, 20
Melastoma guadalupense, 61
Melia triflora, 65
Melica triflora, 65
Mentzelia decapetala, 75; nuda, 75; *ornata*, 75
Menyanthes trifoliata, 18
Menziesia ferruginea, 18
Mertensia maritima, 19
Mespilus flexuosa, 57
Micropetalon gramineum, 65; *longifolium*, 65
Microstylis ophioglossoides, 65
Milium racemosum, 69
Mimosa *brachyloba*, 65; sensitiva, 72
Mimulus guttatus, 19; *langsdorffii*, 19
Mirabilis multiflora, 51
Monarda beckii, 65; *ciliata*, 66; *pilosa*, 66
Moneses uniflora, 18
Monniera brownei, 62
Monotropa *europea*, 66; hypopithys, 66; *procera*, 66
Morellus esculentus, 29; *impudicus*, 29
Myrica gale tomentosa, 16
Myriophyllum spicatum, 18
Myrrhis claytoni, 66; *dulcis*, 66

Najas guadalupensis, 60; *microdon*, 60
Nasturtium *amphibium*, 59; *lacustre*, 56; *nasturtium-aquaticum*, 59; officinale, 59; *palustre*, 59; *sylvestre*, 59
Naumbergia thyrsiflora, 64
Nemopanthus *fascicularis*, 58; *mucronatus*, 58
Neobeckia aquatica, 56

Nepeta glechoma, 61
Nephrodium punctilobulum, 49; *rufidulum*, 49; *tenue*, 49
Nuphar polysepalum, 16
Nuttallia decapetala, 75; *nuda*, 75
Nymphaea polysepala, 16
Nyssa biflora, 66; sylvatica biflora, 66; *triflora*, 66

Oenanthe longifolia, 66
Oenothera longiflora ("*longifolia*"), 66
Orchis foliosa, 61; *fuscescens*, 61; *humilis*, 51; *ichnumonea*, 61; *japonica*, 61; *koenigii*, 61; *membranacea*, 61; *procera*, 61; *psychodes*, 61; *quinqueseta*, 62
Orophaca caespitosa, 67
Oryzopsis *melanocarpa*, 69; *racemosa*, 68
Osmorrhiza claytoni, 66; purpurea, 18
Oxybaphus multiflorus, 51
Oxycoccus *hispidulus*, 60; microcarpus, 18
Oxypolis rigidior, 66

Panicum acroanthum, 25; *angustifolium*, 66; ashei, 67; *barbatum*, 67; dichotomum, 66; latifolium, 67; *macrocarpon*, 67; mattamuskeetense, 67; *nitidum barbatum*, 67; *umbrosum*, 67
Parnassia palustris, 17
Paronychia argyrocoma, 70; hernarioides, 70; sessiliflora, 70
Paspalum pubiflorum glabrum, 25
Pedicularis parviflora, 19; p. *wlassowiana*, 19
Peltandra glauca, 28, 53; virginica, 52; *walteri*, 52
Petalostemum ornatum, 57
Petasites hyperboreus, 20
Phaca caespitosa, 67; lotiflora ("*latiflora*"), 67; *triphylla*, 67
Phaseolus *caribaeus*, 67; *difformis*, 67; *erectus*, 67; *frutescens*, 67; *helvolus*, 61; *latifolius*, 68; *menispermoideus*, 68; *monoicus*, 68; *pitcheri*, 68; *reniformis*, 68; *sarmentosus*, 68; vulgaris, 58
Phegopteris dryopteris, 14
Phellopterus littoralis, 18
Philotria canadensis, 73
Philoxerus vermicularis, 51, 68
Phleum alpinum americanum, 15
Phlox carolina, 68; *revoluta*, 68; *triflora*, 68
Pholiurus incurvus, 23
Picea sitchensis, 11, 14
Pickeringia ("*Pickeringa*") *paniculata*, 68
Pilea pumila, 51
Pinguicula vulgaris, 19
Piptatherium nigrum, 69; *racemosum*, 68
Plantago juncoides, 19; macrocarpa, 19; major, 19; *minima*, 19
Platanthera dilatata, 16; stricta, 16
Pneumaria maritima, 19
Poa annua, 15; eminens, 15; *festucoides*, 69; *glumaris*, 15; *obtusa*, 69; *philadelphica*, 69; *seslerioides*, 77
Podalyria caerulea, 52
Polemonium acutiflorum, 18
Polygala viridescens, 69; *viridi-alba*, 69
Polygonum amphibium *natans*, 69; a. stipulaceum, 46, 69; *fluitans*, 69; natans, 28, 69; virginianum ("*virginicum*"), 69; viviparum, 16
Polypodium vulgare occidentale, 14
Populus tacamahacca, 16
Potamogeton natans, 42; perfoliatus richardsoni, 14; pusillus, 14
Potentilla anserina, 17; pacifica, 17; palustris, 17
Prenanthes *alata*, 20; lessingii, 20; *miamiensis*, 34; *ovata*, 34; *parviflora*, 34; *proteophylla*, 34
Prunus cerasus, 54; emarginata, 69; *littoralis*, 54; maritima, 54; *sphaerocarpa*, 54; umbellata, 54
Pseudosasa japonica, 22
Pterospora andromedea, 66
Ptilimnium capillaceum, 73; costatum, 73
Puccinellia maritima, 15; nutkaensis, 15
Pyrola asarifolia incarnata, 18; minor, 18; secunda, 18
Pyrrhopappus *grandiflorus*, 53; scaposus, 53

Quamoclidion multiflorum, 51
Queria argyyrocoma, 70; *hernarioides*, 70; *sessiliflora*, 70

Radicula aquatica, 56; *nasturtium-aquaticum*, 59; *palustris*, 59; *walteri*, 59
Ranunculus bongardii, 16; cymbalaria, 17; delphinifolius, 70; intermedius, 70; *lacustris*, 70; micranthus, 71; *nelsonii*, 16; *nitidus*, 70; recurvatus, 71; repens, 70; reptans, 17; *saniculaeformis*, 71; septentrionalis pacificus, 17; trichophyllus, 17
Reseda micrantha, 71

Rhinanthus **arcticus**, 13, 19; borealis, 19; crista-galli, 19; groenlandicus, 19
Rhynchosia *difformis*, 67; erecta, 67; latifolia, 68; menispermoidea, 68; minima, 67; reniformis, 68; *simplicifolia*, 68; tomentosa, 67
Rhynchospora *cymosa*, 71; globularis recognita, 71; glomerata, 71; rariflora ("*variflora*"), 71; *teres*, 71
Ribes bracteosum, 17, laxiflorum, 17
Rorippa *americana*, 56; amphibia, 59; anceps, 78; aquatica, 46, 56; astylis, 78; capillipes, 78; danubialis, 78; erythrocaulis, 78; haynaldiana, 78; hungarica, 78; hybrida, 78; islandica, 59; lyrata, 78; morisoni, 78; *nasturtium-aquaticum*, 59; neogradensis, 79; palustris, 17, 59; permixta, 79; pinnatifida, 79; prolifera, 79; quadrivalvis, 79; reichenbachii, 79; repens, 79; silvestris, 79; sonderi, 79; stenophylla, 79; subamphibia, 79; subglobosa, 79; sylvestris, 59; thracica, 79; turczaninowii, 79; walteri, 59
Rosa *rubifolia* ("*sabifolia*"), 71; setigera, 71
Rotala ramosior, 3
Rubus nutkanus, 17; parviflorus, 17; pedatus, 17; spectabilis, 12, 17, stellatus, 17
Rumex acetosella, 16; domestica, 16; hastatulus, 28, 71

Sabatia lanceolata, 55; stellaris, 54
Sagina crassicaulis, 16; *virginica*, 52
Salix cordifolia callicarpaea, 71; lasiandra lancifolia, 16; *obovata*, 28, 71; sitchensis, 15
Sambucus racemosa pubens, 12
Sanguisorba *latifolia*, 17, 71; *media* ("*medica*"), 71; *sitchensis*, 71; stipulata, 17, 71
Sarracenia *heterophylla*, 42, 72; purpurea heterophylla, 46, 72
Sassafras albidum, 63
Savastana odorata, 15
Scandix dulcis, 66; *procumbens*, 76
Schizaea pusilla, 50; *tortuosa*, 50
Schoenus cymosus, 71; *rariflorus*, 71
Schrankia sensitiva, 72
Scirpus caespitosus austriacus, 15; *depilatus*, 72; *ferrugineus*, 72; *glaucus*, 72; *gracilis*, 72; *puberulus*, 72
Scleria reticularis ("*reticulata*"), 72
Scutellaria *cordifolia*, 72, 73; *laevigata*, 73; serrata, 73; versicolor, 72, 73
Sedum nuttallianum ("*nuttallii*"), 73; *torreyi*, 73
Selinum acaule, 74; *gmelini*, 18
Senecio pseudoarnica, 20; triangularis, 20
Serapias reflexa, 61
Serpicula canadensis, 73
Setaria faberii, 25
Sideranthus spinulosus, 74
Silene acaulis, 13, 16; *alba*, 57; baldwinii, 58; douglasii, 57; nivea, 57
Sinapis arvensis, 17
Sison canadense, 76; *costatus*, 73; *majus*, 73; *rubricaule*, 73
Sisymbrium *amphibium*, 59; *a. palustre*, 59; *brachycarpon*, 74; *cheiranthoides*, 73; humile, 74; *nasturtium-aquaticum*, 59; *vulgare*, 59; *walteri*, 59
Sisyrinchium brachycarpum, 74; *humile*, 74
Sium longifolium, 66
Smilax cercidifolia ("*cincidifolia*"), 74
Solidago sarothrae, 53
Specularia *amplexicaulis*, 74; perfoliata, 74
Spergularia canadensis, 16
Sporobolus asper, 51
Starkea spinulosa, 74
Stellaria crispa, 16; humifusa, 16; longifolia, 65; sitchana bongardiana, 16
Streptanthus maculatus, 74; *obtusifolius*, 74; *ovalifolius*, 74
Streptopus amplexifolius, 15
Strophostyles helvola, 61
Swertia perennis, 18
Synthyris bullii, 61

Taraxacum chamissonis, 20; latilobum, 20
Tephrosia *paucifolia*, 60; *prostrata*, 60; spicata, 60; *villosa*, 60
Thalictrum sparsiflorum richardsoni, 17
Thapsia acaulis, 74
Tiarella trifoliata, 17
Tillaea aquatica, 74; *ascendens*, 74
Tillaeastrum aquaticum, 74
Tillandsia juncea, 74; pinifolia ("*prinifolia*"), 74
Tofieldia glutinosa, 15; occidentalis, 15
Torreya nuda, 75
Touterea nuda, 75; *ornata*, 75
Tovara virginiana, 69
Trautvetteria carolinensis, 64
Trichodium perenneum, 75
Trichophorum eriophorum, 76

Tridens flava, 77
Trientalis europaea arctica, 18
Trifolium repens, 17; stoloniferum, 76
Triglochin maritimum, 14
Trigonella americana, 76; *sericea*, 76
Triodia chapmani, 22; flava, 77
Trisetum cernuum, 15; spicatum, 65
Tsuga heterophylla, 11, 14; mertensiana, 14
Tussilago frigida, 20

Uraspermum canadense, 76; *claytoni*, 66; *procumbens*, 76
Urtica gracilis, 16

Vaccinium *hispidulum*, 60-61; ovalifolium, 18; parvifolium, 18; uliginosum, 18
Vaginaria scirpoides, 76
Vahlodea atropurpurea paramushirensis, 15
Valerianella *coerulea*, 60, 76; locusta, 60, 76
Veratrum eschscholtzii, 15
Verbena bipinnatifida, 76
Veronica americana, 19
Vexillaria mariana, 77; *plumieri*, 77
Viburnum tinus ("*linus*"), 77
Vicia hirsuta, 77; *mitchelli*, 77; *mitchilla*, 77
Viola adunca, 17; epipsela, 17; glabella, 17; langsdorffii, 17
Vulpia elliotea, 22

Windsoria seslerioides, 77
Wisteria frutescens, 67
Woodsia ilvensis, 49; obtusa, 49
Wulfenia bullii, 61

Xylosteum solonis, 32, 42, 77

Yucca aloifolia ("*alnifolia*"), 77; *draconis*, 77

Zephyranthes atamasco, 51
Zizania aquatica angustifolia, 24

2/73

No. 25 1949

BARTONIA

JOURNAL OF THE PHILADELPHIA BOTANICAL CLUB

CONTENTS

Work and Publications of Henry Muhlenberg, with Special Attention to Unrecorded or Incorrectly Recorded Binomials — E. D. Merrill and Shiu-Ying Hu 1
The Last Sickness of Rafinesque .... Francis W. Pennell 67
Occurrence of Franklinia in Cape May County, New Jersey .... Henry Fox 69
Further Observations on eastern Tiarellas .... Edgar T. Wherry 70
Trillium pusillum in Maryland .... E. T. Wherry 71
Postscript on eastern Lilies .... E. T. Wherry 71
Lemna trisulca, a southward Extension of Range on the Atlantic Coastal Plain .... Stanley D. Wikoff 72
Supplementary Notes on the Cladoniae of Pennsylvania .... W. L. Dix 74
A Plastic Spray for coating Herbarium Specimens .... E. T. Wherry 86
Lee Sowden .... Walter M. Benner 86
Program of Meetings from 1946 to 1948 87
List of Officers and Members, 1946-1948 88
Index to Genera 91

Published by the Club
Academy of Natural Sciences, Nineteenth and the Parkway
Philadelphia
Issued October 12, 1949

MISSOURI BOTANICAL
RECEIVED
OCT 26 1949

BARTONIA

Journal of the Philadelphia Botanical Club.

A journal devoted primarily to the Flora of the mid-eastern and southeastern United States, especially of eastern Pennsylvania, New Jersey and Delaware.

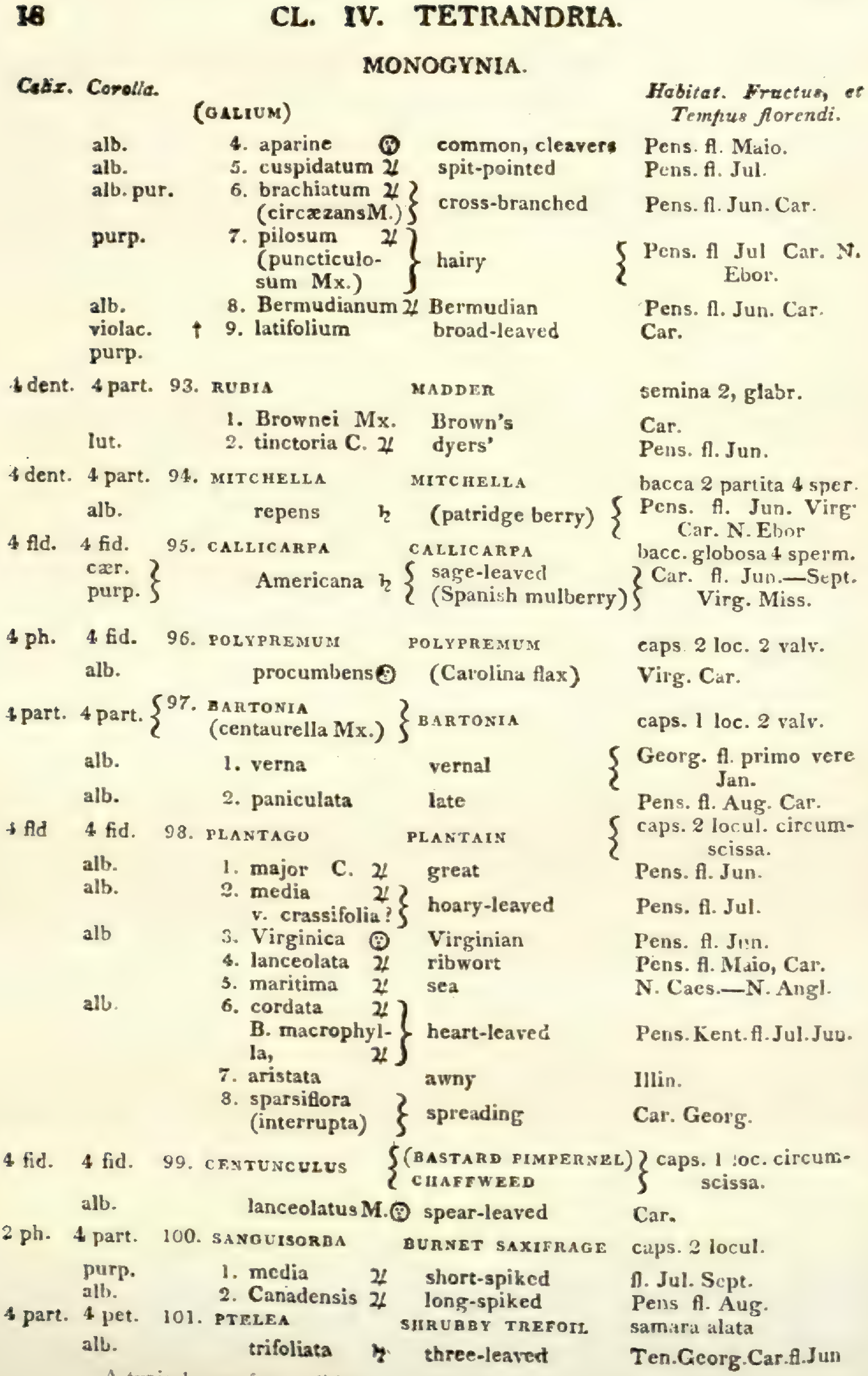
Subscription Price, $1.00. Past numbers, $1.00 each.

Contributors of articles having four or more pages will receive gratis fifty reprints. Additional reprints, if ordered in advance, may be purchased at cost.

Address

DR. FRANCIS W. PENNELL,
Editor,

Academy of Natural Sciences, Nineteenth and the Parkway,
Philadelphia 3, Pa.



18

CL. IV. TETRANDRIA.

MONOGYNIA.

Calix.	*Corolla.*			*Habitat. Fructus, et Tempus florendi.*
		(GALIUM)		
	alb.	4. aparine ☉	common, cleavers	Pens. fl. Maio.
	alb.	5. cuspidatum ♃	spit-pointed	Pens. fl. Jul.
	alb. pur.	6. brachiatum ♃ (circæzansM.)	cross-branched	Pens. fl. Jun. Car.
	purp.	7. pilosum ♃ (puncticulosum Mx.)	hairy	Pens. fl Jul Car. N. Ebor.
	alb.	8. Bermudianum ♃	Bermudian	Pens. fl. Jun. Car.
	violac. purp.	† 9. latifolium	broad-leaved	Car.
4 dent.	4 part.	93. RUBIA	MADDER	semina 2, glabr.
		1. Brownei Mx.	Brown's	Car.
	lut.	2. tinctoria C. ♃	dyers'	Pens. fl. Jun.
4 dent.	4 part.	94. MITCHELLA	MITCHELLA	bacca 2 partita 4 sper.
	alb.	repens ♄	(patridge berry)	Pens. fl. Jun. Virg. Car. N. Ebor
4 fid.	4 fid.	95. CALLICARPA	CALLICARPA	bacc. globosa 4 sperm.
	cær. purp.	Americana ♄	sage-leaved (Spanish mulberry)	Car. fl. Jun.—Sept. Virg. Miss.
4 ph.	4 fid.	96. POLYPREMUM	POLYPREMUM	caps. 2 loc. 2 valv.
	alb.	procumbens ☉	(Carolina flax)	Virg. Car.
4 part.	4 part.	97. BARTONIA (centaurella Mx.)	BARTONIA	caps. 1 loc. 2 valv.
	alb.	1. verna	vernal	Georg. fl. primo vere Jan.
	alb.	2. paniculata	late	Pens. fl. Aug. Car.
4 fid	4 fid.	98. PLANTAGO	PLANTAIN	caps. 2 locul. circumscissa.
	alb.	1. major C. ♃	great	Pens. fl. Jun.
	alb.	2. media ♃ v. crassifolia?	hoary-leaved	Pens. fl. Jul.
	alb	3. Virginica ☉	Virginian	Pens. fl. Jun.
		4. lanceolata ♃	ribwort	Pens. fl. Maio, Car.
		5. maritima ♃	sea	N. Caes.—N. Angl.
	alb.	6. cordata ♃ B. macrophylla, ♃	heart-leaved	Pens. Kent. fl. Jul. Jun.
		7. aristata	awny	Illin.
		8. sparsiflora (interrupta)	spreading	Car. Georg.
4 fid.	4 fid.	99. CENTUNCULUS	(BASTARD PIMPERNEL) CHAFFWEED	caps. 1 loc. circumscissa.
	alb.	lanceolatus M. ☉	spear-leaved	Car.
2 ph.	4 part.	100. SANGUISORBA	BURNET SAXIFRAGE	caps. 2 locul.
	purp.	1. media ♃	short-spiked	fl. Jul. Sept.
	alb.	2. Canadensis ♃	long-spiked	Pens fl. Aug.
4 part.	4 pet.	101. PTELEA	SHRUBBY TREFOIL	samara alata
	alb.	trifoliata ♄	three-leaved	Ten. Georg. Car. fl. Jun

A typical page from edition one of Muhlenberg's "Catalogus", 1814

BARTONIA

JOURNAL OF THE PHILADELPHIA BOTANICAL CLUB

No. 25 PHILADELPHIA, PA. 1949

Work and Publications of Henry Muhlenberg, with Special Attention to Unrecorded or Incorrectly Recorded Binomials

E. D. Merrill and Shiu-ying Hu

Henry Muhlenberg's father Henry [Heinrich] Melchior Muhlenberg, D.D., was born at Einbeck, Hanover, September 6, 1711, and was educated at the Universities of Göttingen and Halle. Having been urged to accept an appointment in the ministry of the Lutheran church in Philadelphia, he left Germany for England in 1742, landed at Charleston, South Carolina, September 23, and arrived in Philadelphia November 25 of that year. His remaining life was spent in the service of the church, chiefly in Philadelphia, where he organized the first Lutheran synod in America in 1748, and eventually became known as the "Patriarch of the Lutheran Church in America." He died at Trappe, Pennsylvania, October 7, 1787.[1]

Gotthilf Henry [Heinrich] Ernst Muhlenberg,[2] his youngest son, was born at New Providence, now Trappe, Pennsylvania, November 17, 1753. In the spring of 1763 he accompanied his two older brothers to Halle, spending about seven years there in educational pursuits. Soon after his return to Philadelphia in 1770, he was ordained as a Lutheran preacher. The British occupation of that city in 1777, during the troublesome times of the American Revolutionary War, forced him to flee because of his active sympathy with the colonial cause, in his own words, as reported by Maisch:[3] "'In 1777 mussten wir abermals in die Flucht,' schreibt er; 'ich selbst folgte meiner Familie am 22 September, und konnte sie erst in Jahrzeit wieder zurücknehmen, nachdem die Engländer im Juli 1778 die Stadt verlassen.'" Stoever states regarding this episode, and the beginning of Muhlenberg's interest in botany:

---

[1] **Stoever, M. L.,** Memoir of the Life and Times of Henry Melchior Muhlenberg, D.D., Patriarch of the Evangelical Lutheran Church. i-xii. 13-120. *portr.* 1856. Philadelphia. Lindsay and Blakiston.

Mann, W. J., Life and Times of Henry Melchior Mühlenberg. i-xvi. 1-547. *portr.* 1888. Philadelphia. G. W. Frederick.

[2] The family name was originally Mühlenberg [Muehlenberg], but his father apparently adopted the anglicized form Henry Melchior Muhlenberg. At any rate the subject of this sketch invariably used the anglicized form. His technical publications, other than those published in Germany under the editorship of Willdenow, appeared under the name Henry Muhlenberg, or some, with Latin titles, as "auctore Henrico Muhlenberg;" all of his original letters that we have seen are signed merely as H. Muhlenberg. For a wealth of bibliographic data appertaining to the Muhlenberg family see **Reichmann, F.** The Muhlenberg Family. A Bibliography Compiled from the Subject Union Catalog Americana-Germanica of the Carl Schurz Foundation. 1-43. 1943.

> "As he was threatened with the halter, because of his thorough republicanism and zealous devotion to the cause of the Revolution, he found it necessary to flee from the scene of danger. Disguised under a blanket, with a rifle on his shoulder, he had nearly fallen into hostile hands, through the snares of an innkeeper, who had intentionally directed him to take the road by which the British were approaching. Warned, however, in season, by a Whig occupant of the house, he succeeded in making his escape, and reached New Hanover in safety. Relieved for a time from professional duties, he engaged with great zest in the study of botany, and acquired that love for his favorite pursuit which afterwards so strongly manifested itself. On the election of his brother[4] to a civil office, he succeeded him as pastor. In the year 1780, he removed to Lancaster, where he labored with great efficiency until his death, in 1815, holding a high rank as a scholar, and distinguished as a minister of the gospel—enjoying the uninterrupted regard of his congregation, and exerting an influence in the community which is rarely the privilege of the most highly favored to enjoy."

It has been claimed that Muhlenberg initiated his botanical studies while he was a student in Germany, but as he was only seventeen years old when he returned to Philadelphia, this seems to be unlikely, although he may well have developed interest in the subject at that time. Stoever's categorical statement would seem to indicate that in botany he was self-trained, and that the beginning of his intensive study of the subject coincided with the time he was a refugee from Philadelphia, September, 1777 to July, 1778. Maisch states that his first botanical explorations were initiated in 1780.

The episode of his flight from Philadelphia, to which he was not able to return until after the city had been abandoned by the British troops in July, 1778, as expressed by Maisch is:

> "Mühlenberg's botanische Thätigkeit beginnt erst mit seiner Flucht von Philadelphia, wo er in ländlicher Zurückgezogenheit seine Aufmerksamkeit den lieblichen Kindern Flora's zuwenden konnte. Nach seiner Rückkehr nach Philadelphia wurde das Studium der Botanik ernstlich aufgenommen und das Interesse für die minder in die Augen fallenden Blüthenpflanzen, sowie für die Krypto-

---

[3] **Maisch, J. M.,** Gotthilf Heinrich Ernst Mühlenberg als Botaniker. Pharm. Rundschau **4**: 119-129. 1886 (Reprint, p. 7). The reprint was actually published in New York.

[4] Peter Muhlenberg, 1746-1807. He served with distinction in the American Revolutionary War, attaining the rank of General, later serving as a member of the United States Senate.

gamen allmälig angeregt. Sein Vater scheint weder als Forscher noch als Sammler von Pflanzen thätig gewesen zu sein, obwohl er mit in Europa lebenden Naturforschern in brieflicher Verbindung stand."

This Maisch paper naturally deals very largely with Muhlenberg's botanical interests and activities.[5] In 1780 he accepted appointment as pastor of the Lutheran church at Lancaster, Pennsylvania, spending the remaining 35 years of his life there.

As soon as possible after the close of the Revolutionary War, Muhlenberg commenced to correspond with various European botanists, sending them specimens for identification and for verification, and exchanging duplicates for similar foreign material. It was but natural that his first correspondents were the active German botanists of the time, but he did not confine his correspondence to these. Eventually he sent a few technical manuscripts to Willdenow for publication in Germany, and also, from time to time, sent to him, and others, with specimens, the descriptions of various species which he considered to be new; these were published in such works as Willdenow's edition of the "Species plantarum" (1797-1830), his "Enumeratio plantarum horti regii botanici Berolinensis" (1809), and in Schkuhr's "Riedgräser" (1801-06). Muhlenberg's first European botanical correspondent was J. D. C. Schreber, but the list was soon extended to include Messrs. Acharius, Aiton, Batsch, Beauvois, Hedwig, Hoffmann, Persoon, Schöpf, Schkuhr, Schrader, Smith (Sir J. E.), Sprengel, Sturm, Swartz, Thebaud, Turner, Willdenow, and doubtless others.

He also carried on an extensive correspondence with various Americans interested in botany, listing 31 individuals in 1813 and in 1818 to whom he was indebted for specimens or seeds, these being Messrs. Baldwin, Barton, William Bartram, Billy, Beck, Brickell, Cleaver, Collins, Cutler, Dallman, Denke, Eddy, Elliott, Enslin, Green, Hamilton, Kampman, Kin, Kramsch, Lyon, McMahon, Mease, Mitchell, Moore, P. E. Muhlenberg, Müller, Pursh, Rafinesque, Van der Schott, Van Vleck, and Mrs. Gambold. He was closely associated with the various botanists of the Philadelphia area throughout the period of his active interest in botany. There are numerous references to some of these individuals in the unpublished Muhlenberg letters[6] to Stephen Elliott, 1808-1815.

Mann states, regarding Muhlenberg's botanical work:

"To his father such studies [as botany] may have appeared to be no more than dilettantism, and he gives vent to his feelings in a letter of Apr. 3, 1780, saying that he had learned that his son Henry had already no less than sixty catechumens under his care at Lancaster, and adding, 'this is more fruitful and blessed than to collect *varianten* and herbs.'[7] Whether, with theologians, he understands under *varianten* diverse readings of the old manuscripts of the Bible we leave undecided. But the collecting of plants by his son was indeed connected with solid study. He was acknowledged as maintaining in his time the highest rank in that science; various plants discovered and classified by him were named in honor of him; he was in correspondence with the first authorities in that field of knowledge in Europe and in America, and in its interests was visited by men of the highest renown—among them Alexander von Humboldt and Aimé Bonpland on their return from South America and Mexico. Deputies from the emperor of Austria sent to this country paid him their respects and with attention viewed his botanical and mineralogical collections. Many literary, philosophical, and scientific associations were proud to count him among their members. The University of Pennsylvania honored him with the degree of master of arts; the College of New Jersey, at Princeton, with that of doctor of divinity."

---

[5] See also **Harshberger, J. W.** The Botanists of Philadelphia and Their Work. pp. 93-97, *portr.* 1899, and also **Wallace, P. A. W.** Henry Ernest Muhlenberg. Proc. Am. Philos. Soc. **92**: 108-110. 1948; The Muhlenbergs and the Revolutionary Background. op. cit. **93**: 119-126. 1949.

[6] These letters are in the library of the Arnold Arboretum. They were found in a partial preliminary draft of Elliott's "Sketch of the Botany of South Carolina and Georgia," this manuscript having been acquired from a dealer by Charles Sprague Sargent. Copies of them have been given to the Academy of Natural Sciences of Philadelphia.

As an indication of the esteem in which Muhlenberg was held by the botanists of his time in Philadelphia, the following passage is quoted from W. P. C. Barton's "Florae Philadelphicae prodromus" vii, dated October 1, 1815:

"The author takes this opportunity of acknowledging the assistance he received during his collections from the late Dr. Henry Muhlenberg. . . . The pious, the learned Muhlenberg, is no more! With him has fallen one of the oldest, the strongest pillars of that extensive fabric his exertions contributed so largely to raise—the edifice of botanick science in America. His merits, though chiefly confined to nomenclatural botany, were of the highest order. In giving information he was conscientious as truth itself, and his patience and industry in correcting the errors and confusion of botany, have scarce a parallel. Ever ready to assist the young botanist, and to banish from his sight, obstacles which in his own progress he himself had overcome, it seems extraordinary that few, if any, of the large number that have profited by his labours and been the objects of his personal or epistolary instruction, should have acknowledged the extent of his assistance! The friend, whose succor contributed to raise us to our desired elevation, is often, when no longer useful, cast away! Dr. Muhlenberg enjoyed the correspondence of some of the first European botanists of the age, Schreber, Smith, Willdenow, &c., and the rich volumes of the Species Plantarum by the latter, are enhanced in no small degree by the communications made to him by our American botanist. The posthumous works of Dr. Muhlenberg are anxiously expected by lovers of botany. When they are presented to the publick . . . the chief barriers to the successful cultivation of botany in the United States will be removed—since these, together with Pursh's Flora, already published, though it has not yet reached this country, will fill the present chasm in the botanical libraries of America."

More or less pertinent to this discussion is the following quotation from the same author's "Compendium florae Philadelphicae," **1**: Preface [2], dated July **11, 1818:**

---

[7] Professor Paul A. W. Wallace of Lebanon Valley College, to whom a copy of the original manuscript of this paper was sent, calls attention to the fact that in translating the letter of April 3, 1780, Mr. Mann abbreviated unduly and in so doing weakened the point. The crucial sentence in the original letter is as follows: "dass wird unendlich mehr Segen und Gnaden-Lohn, zu wege bringen, als alle noch verborgens *Varianten* oder *Linaei* Kräuter Wissenschaft aus zu forschen."

> "All the plants described in this Flora, with the exception of about twenty have been personally collected by the Author—and in all cases of doubt or difficulty recourse has been had to the Herbarium of the late Dr. Muhlenberg, in the American Philosophical Society, whereby all that certainty has been attained which a source so authentic could produce . . .
>
> "It is a matter of no little satisfaction that I mention as the property of the American Philosophical Society, this valuable and authentic Herbarium consisting of Dr. Muhlenberg's entire collection of American plants. The well-known circumspection and patience of that botanist, and the length of time in which the herbarium was arranged, add greatly to its value as authority.
>
> "It is but due to those concerned, to remark, that at a period when this herbarium was eagerly sought after, not only by persons in distant states, but by foreigners, it was proffered by the son of Dr. Muhlenberg, whose property it became, to Mr. Collins, for the American Philosophical Society, at a price considerably less than might otherwise have been obtained for it; and this gentleman, improving the occasion, promptly purchased it with a view to its ultimate destination as a part of the museum of that institution to which it has since been presented by Mr. Zaccheus Collins, Chief Justice Tilghman, Dr. Wistar, Dr. James, Mr. George Pollock, Mr. William Short, Mr. John Vaughan, Dr. Champan [Chapman], and Dr. Dorsey."

The above is the first published statement that we have seen regarding the acquisition of the Muhlenberg herbarium for the American Philosophical Society.

Somewhat isolated as he was in the then small town of Lancaster, Pennsylvania, Muhlenberg manifestly took very great pleasure in his extensive botanical correspondence and in his pioneer botanical work. Because of the slowness in transmission of letters and of parcels of plants, characteristic of the time, and because of the unsettled conditions incident to the American Revolution and the later War of 1812, he experienced exasperating delays, and one frequently notes references to these in his letters; particularly in the slowness with which some of his European correspondents responded; see p. 18.

Muhlenberg died in Lancaster, May 23, 1815, not June 24, 1817, as given by Pritzel.[8] We quote from a letter written by Zaccheus Collins to Stephen Elliott, dated Philadelphia, May 28, 1815:

> "I feel it incumbent on me the melancholy task of announcing to you, that your amiable and valued friend Muhlenberg is no more. . . . On the morning of the 23rd inst. he was affected with symptoms of Paralysis, which soon disappeared, leaving an unimpaired intellect, but great physical debility, thus he remained til evening when the paroxysm was repeated which in a little while terminated his valuable life."

MUHLENBERG'S PUBLISHED BOTANICAL PAPERS

It is clear that Muhlenberg sent many hundreds of specimens to his European colleagues for identification, in many cases these specimens being accompanied by his own descriptions of those that he considered to be unnamed and undescribed. This accounts for the very considerable number of species in various groups that were described in the works of several European botanists with Muhlenberg as the authority for the names. He depended upon various specialists and productive general botanists in Europe to assist him in the determination of his specimens, sending packages of duplicate numbered specimens for this purpose.

---

[8] **Pritizel, G. A.** Thesaurus literaturae botanicae, ed. 2, 266. 1872.

He did prepare a very large amount of descriptive manuscript (see p. 16) most of which was never published. His list of actually published technical papers in botany is rather short, and several of these were not printed until after his death. The list follows:

Index florae Lancastriensis. Trans. Am. Philos. Soc. **3**: 157-184. 1793.

This is a mere list, but with a certain number of new species indicated, all ***nomina nuda***. The manuscript was presented to the American Philosophical Society, February 18, 1791.

Supplementum indicis florae Lancastriensis. op. cit. **4**: 235-242. 1799.

Supplementary to the preceding item, and similar to it in content. The manuscript was presented to the American Philosophical Society, September 16, 1796.

Kurze Bermerkungen über die in der Gegend von Lancaster in Nord-America wachsenden Arten der Gattungen Juglans, Fraxinus und Quercus; mit Anmerkungen vom Herrn Professor C. L. Willdenow. Neue Schrift. Ges. Naturf. Freunde Berlin **3**: 387-402. 1801.

Notes on twenty species, some described as new.

Observations on the Genera Juglans, Fraxinus, and Quercus, in the Neighborhood of Lancaster, in North America. In: **Konig, C.**, Tracts Relative to Botany. 241-259. 1805. Phillips and Fardon, London.

An English translation of the preceding item.

Ueber die Nordamericanischen Weiden mit Anmerkungen vom Herrn Prof. Willdenow. Neue Schrift. Ges. Naturf. Freunde Berlin **4**: 233-242. *pl. 1-6.* 1803.

Consists of the original descriptions of ten new species of *Salix*, taken from his unpublished "Uberiori descriptione plantarum Lancastriensium."

On North American Willows by the Rev. Mr. Muhlenberg, with Notes of Prof. Willdenow. Ann. Bot. Konig & Sims **2**: 62-69. *pl. 1-5.* 1806.

Republication of the preceding item, the German parts of the text translated into English.

Catalogus plantarum Americae septentrionalis hucusque cognitarum indigenarum et cicurum, or, a Catalogue of the Hitherto Known Native and Naturalized Plants of North America, Arranged According to the Sexual System of Linnaeus. i-iv. 1-122. 1813. W. Hamilton, Lancaster.

The introduction is dated August 3, 1813. However, the list of cryptogamous plants still remained to be added. It was not published and distributed until October, 1813, see p. **7**.

Descriptio uberior plantarum graminum et plantarum calamarium Americae septentrionalis. i-ii. 1-295. 1817. S. W. Conrad, Philadelphia.

Posthumously published, the introduction signed by F. A. Muhlenberg, son of the author.

Catalogus plantarum Americae septentrionalis . . . . Second Edition, Corrected and Enlarged. i-iv. 1-222 [1]. 1818. S. W. Conrad, Philadelphia.

Reduction of All the Genera of Plants Contained in the Catalogus plantarum Americae septentrionalis to the Natural Families of De Jussieu's System. In: **Smith, J. E.** Grammar of Botany. 213-224. 1822. James V. Seeman, New York.

Muhlenberg is credited with being the author of this addition to the New York edition of Smith's work, but this was apparently compiled by the editor of the New York edition, an individual unknown to us. In the notice, p. v. of the Introduction, the statement is made: "A reduction of all the Genera in Muhlenberg's Catalogue of North American Plants to their proper places in Jussieu's arrangement, has been added at the suggestion of Dr. [Samuel L.] Mitchill, thus increasing the value to the American Botanist."

MUHLENBERG'S CATALOGUS

In the first edition of this work, published in Lancaster in 1813, Muhlenberg lists (including the cellular cryptogams) 853 genera and about 3670 species. There are various references to this work in his letters to Stephen Elliott, confirming the statement in the preface that the text was completed in 1809, that printing commenced in November, 1812, and that the work was finished (as to the phanerogams) " toward the end of July " 1813. The cryptogamous plants were then added and the " Catalogus " was issued in October, 1813.

References to this work in Muhlenberg's letters to Stephen Elliott, are as follows: On June 16, 1809, he states that the copy for the phanerogamous plants was finished " but it is not printed yet because I wish to correct the sheets myself and we have no printer in Lancaster able to undertake the printing." On November 8, 1809, he mentioned it again: " All is ready for the press, but I find some difficulties, the want of a printer near at hand and the wish to have the catalogue more complete are the chief." On March 30, 1810, he wrote: " My Catalogue has no descriptions. . . . I find great difficulty in getting it printed. I have tried here [Lancaster] and in Philadelphia." January 5, 1812, he states: " My Catalogue . . . has long ago been ready for the press, probably it might be printed this winter in Lancaster." On October 5, 1812, he wrote in connection with the appearance of Barton's " Flora Virginica " that he had learned that Pursh was publishing a new flora of North America in London, and states, " I find it extremely difficult to get even a small Catalogue printed." His letter of December 1, 1812, includes this statement: " Mr. Hamilton has begun the printing of my catalogue but goes on very slowly about ½ sheet every month. I have thought of adding the cryptogamous plants." On January 14, 1813, he added: " My Catalogue goes very slow, the five first Classes to the Umbellatae are printed from Nov. 1811, until now, and all my begging and driving is of no use." On July 20, 1813: " My Catalogue of the Phanerogamous plants is at last printed, and the 24 Class will be added before the Catalogue is published. How long this will be I do not know, the printer is not to be got out of his slow step. Whenever the whole is done I shall do myself the pleasure of sending you a copy." Finally on November 7, 1813, he states: " October 12 I put a copy of my Catalogue in the mail, post paid, for you." We may infer that probably October 12, 1813, is very close to the date of issue of this small work. Ten months for the actual printing of a 112 page pamphlet, and his statement that there was at first no printer in Lancaster able to undertake the work! With the eminence that Lancaster has enjoyed for many decades as one of the most important centers in the United States for the publication of scientific literature, the contrast between Muhlenberg's times and our own is very great.

There are no descriptions, but there are many new names, mostly as *nomina nuda*, but some of the new names are actually validated by the citation of synonyms. In general authorities are not given for accepted names, Muhlenberg doubtless being influenced in this procedure by Donn's "Hortus Cantabrigiensis" with which he was familiar.

Three years after Muhlenberg's death a second edition of the "Catalogus" was issued in Philadelphia. The title was registered by S. W. Conrad, Feb. 27, 1818, and the work was issued sometime during that year. The format is the same as that of the first edition, but with various corrections and additions, the number of genera being increased to 877, and of species to about 3810. The text was prepared by Muhlenberg, for he explained to Elliott, in a letter dated December 6, 1813, that he had prepared an inter-leaved copy of the first edition, and that he was including additions and corrections, apologizing for the poor quality of the paper used in the printing of the first edition.

In both editions of the "Catalogus" many new binomials appear, these, for the most part, strictly *nomina nuda* as noted above. In some cases synonyms are added, or at least the generic name from which a "transferred" specific name was taken is indicated. Some of Muhlenberg's contemporaries and immediate successors accepted a certain number of his proposed new names and validated them by preparing descriptions and citing the basic synonyms; these were W. P. C. Barton, Bigelow, Sprengel, Trinius, Torrey, Beck, Eaton, Elliott, Rafinesque, Chapman, A. Gray, and others, while some were validated by Muhlenberg's own descriptions as published in his "Descriptio" in 1817. Pursh's rather shabby treatment of certain of Muhlenberg's original binomials is discussed below (p. 27).

Many of Muhlenberg's new names were listed by Steudel[9] and others, and thus have found their places in standard indices. However there is much confusion in entries as between the original edition of 1813 and the second one of 1818, a peculiarly high percentage of entries in "Index Kewensis" being to the second edition rather than to the original one of 1813. Thus in this work there are about 185 cases, below indicated by the sign †, where minor changes in entries should be made.

Because Muhlenberg in general rarely cited the authority for the binomials that he accepted it is rather surprising that so many of his new names were actually listed by those bibliographers who were primarily concerned with detecting and listing new plant names. In his "Catalogus" Muhlenberg never cited himself as the author of a new name. Nor did he indicate that any of the names which he originated were actually new, except for a limited number of lichens in the first edition which he characterized by adding the letters "N.S." A list of these new names for the cellular cryptogams is given below. In order to determine what may have originated with him it has been necessary to check all the binomials for the flowering plants against the entries in "Index Kewensis" and its ten supplements.

[9] **Steudel, E. G.** Nomenclator botanicus, ed. 1, 1821; ed. 2, 1840-41.

We have checked the names of only the phanerogams and the vascular cryptogams. We call attention to the fact, however, that in the first edition of the "Catalogus" there are a certain number of new specific names proposed for lichens; and for that matter, a few also for various genera of cellular cryptogams in the earlier works that Muhlenberg published on the flora of Lancaster. These are, however, mostly *nomina nuda,* and as such, of course have no taxonomic standing. In his first paper, published in 1793, he explained that for those species for which he could find no name in the published works available to him and in the lists of names received from his European correspondents: "If I could find no name by these means, I was forced to make one myself adding N.S. until better informed by abler botanists." The same system was continued in his second paper of 1799.

The *nomina nuda* for a few mosses and for one lichen indicated as "N.S." in the "Supplementum indicis florae Lancastriensis" (1799), are: *Hypnum pilosum, H. obtusifolium, H. fragile, H. salebrosum,* and *Lichen umbrinus.* In the first edition of his "Catalogus" (1813), the binomials so indicated, all for lichens, are: *Lecidea varians, L. spadicea, L. sorediata, Gyrophora mamillata, Porina papillata, Lecanora internata, Parmelia cyliphora, P. placorodia, P. crinita, P. galbinea, P. rudecta, P. obsessa, P. granulifera, P. cristulata,* and *Usnea angulata.* None of the names accepted in the second edition of the "Catalogus" (1818) is there indicated as new.

MUHLENBERG'S CATALOGUS IN RELATION TO JAMES DONN'S HORTUS CANTABRIGIENSIS

Muhlenberg apparently did what few other botanists have done in that he examined all the entries in those editions of Donn's "Hortus Cantabrigiensis" that were available to him, in order to detect the names of species credited by Donn to North America. The latest edition that was available to him was that of 1809 (edition five). We say "what few other botanists have done," because there are a great many new binomials published in the various editions of Donn's work that do not appear in our standard indices. All of the entries in editions one (1796) to five (1809) are strictly *nomina nuda,* so that it makes very little difference whether or not these fugitive names are ever listed. In the first five editions no synonyms are given under any of the entries.

Beginning with edition six (1811) the picture is somewhat different, for in this and in succeeding editions up to thirteen (1845) some synonyms are listed, which in certain cases validate some of the new binomials. In the present paper we have, in general, not concerned ourselves with these new Donn names except where Muhlenberg accepted them in his "Catalogus." Incidentally it may be of some interest to American botanists to note that Frederick Pursh was the author of editions eight (1815) and nine (1819) of Donn's work. We have done a certain amount of random sampling in the various editions of the "Hortus Cantabrigiensis" with a view to locating unlisted but validly published binomials, examples of unlisted or incorrectly listed new names being as follows:

Amomum *casumunar Donn, Hort. Cantab. ed. 7, 1. 1812, *nom.* (*Zingiber casumunar* Roxb.).

Crataegus *intermedia Donn, op. cit., ed. 3, 93. 1804, *nom. nud.* Validated ed. 6, 137. 1811, by the addition of the synonym *Pyrus intermedia* [Ehrh.].

Crataegus *odoratissima Donn, op. cit. ed. 5, 122. 1809, *nom. nud.* Validated ed. 6, 137. 1811, by the addition of the synonym *Mespilus odoratissima* Andr.

Galax *cordifolia Pursh ex Donn, op. cit., ed. 8, 60. 1815, *nom.* (*Blandfordia cordata* Andr., *Galax aphylla* Linn.).

Knowltonia *capensis Donn, op. cit. ed. 4, 130. 1807, *nom. nud.* Validated ed. 7, 167. 1812, by the addition of the synonym *Adonis capensis* Linn.

Lobelia †tupa Donn, op. cit. ed. 6, 51. 1811, *nom.* (*Lobelia gigantea* Cav.). The "Index Kewensis" entry is Donn ex Steud., Nomencl. ed. 1, 491. 1821.

Melanthium *triquetrum Donn, op. cit. ed. 3, 64. 1804, *nom. nud.* Validated ed. 7, 103. 1812, by the addition of the synonym *Melanthium junceum* Jacq.

Mespilus *ovalis Donn, op. cit. ed. 4, 115. 1807, *nom. nud.* Validated ed. 6, 138. 1811, by the addition of the synonym *Pyrus ovalis* Willd.

Nicotiana *odorata Donn, op. cit. ed. 3, 35. 1804, *nom. nud.* Validated ed. 6, 54. 1811, by the addition of the synonym *Nicotiana undulata* Sims. The "Index Kewensis" entry is *Nicotiana* "odorata Hort.—Cf. Gard. Chron. (1881) II. 183."

Nycterium †flavum Pursh ex Donn, op. cit. ed. 8, 63. 1815, *nom.* (*Solanum heterandrum* Pursh); the "Index Kewensis" entry is Lindl. ex Donn Hort. Cantab. ed. 11, 76. 1826.

Platylobium *latifolium Donn, op. cit. ed. 7, 202. 1812, *nom.* (*Bossiaea scolopendria* Sims).

Protea †strobolina Donn, op. cit. 14. 1796, *nom. nud.* Validated ed. 6, 31. 1811, by the addition of the synonym *Protea globosa* Andr.; the "Index Kewensis" entry is Donn ex Steud. Nom. ed. 2, **2**: 401. 1841.

That Muhlenberg was concerned with the fugitive new names, which in the following quoted passage we have marked with an asterisk, is evidenced in his correspondence with Stephen Elliott. In a letter dated January 14, 1813, he states:

> "Donn in his new edition of Cambridge plants [ed. 5, 1809] has a number of N. American new species which I do not know by their present names. Can you explain them? Veronica romana, Houstonia *divaricata, Pulmonaria *mollis, Phlox pyramidalis, suffruticosa, Celastrus bullatus, Viola *pygmaea, Ampelopsis hirsuta, Gentiana fimbriata (crinita ?), Viburnum *ulmifolium, Pancratium rotatum, Prinos lanceolatus, Vaccinium cerasifolium, Menziesia globularis, Laurus geniculata, aestivalis (?), Podalyria *virginica, Cassia *discolor, Lythrum triflorum, Mespilus prunifolia, Rosa serotina, *stricta, Rubus *purpureus, Sarracenia adunca, Clematis pennsylv., cylindrica, *triternata, Stachys intermedia, Thymus grandiflorus, Scutellaria pubescens, serrata, Hibiscus incanus, Fumaria formosa, Dolichos *miamensis (Glycine umbellata ?), Trifolium involucratum, Hypericum pyramidatum, elatum, Inula glandulosa, Rudbeckia *lobata, Silphium *varians, Quercus candida, Juglans *minima, *hispida, pubescens, Mimosa *divaricata, *miamensis, Ophrys hystrix, minor. If you have sent some of them pray mention the numbers. I suppose many of them Mr. Lyon exported."

Many of the species in the above list had been published here and there by various authors in works that were apparently not available to Muhlenberg, but at least the sixteen above marked with an asterisk are still unlisted. In the first edition of his "Catalogus" he accepted seventeen of the Donn binomials, these mostly appearing for the first time in edition four (1807), and at least one in edition five (1809); a few in earlier editions. The list is *Acacia *divaricata* Muhl. Cat. 96. 1813; *Mimosa *divaricata* Donn, Hort. Cantab. ed. 4, 222. 1807; *Acacia *miamensis* Muhl. Cat. 96. 1813; *Mimosa *miamensis* Donn, op. cit., 223; *Andromeda *serratifolia* Donn, ed. 4, 98. 1807, Muhl. Cat. 43. 1813; *Aster *albus* Donn, ed. 3, 156. 1804, Muhl. Cat. 75; *A. *flexuosus* Donn, ed. 2, 109. 1800, Muhl. Cat. 73; *Cassia *discolor* Donn, ed. 4, 95. 1807, Muhl. Cat. 42; *Clematis *triternatea* Donn, ed. 4, 129. 1807, Muhl. Cat. 54; *Houstonia *divaricata* Donn, ed. 4, 28. 1807, Muhl. Cat. 15; *Ledum *decumbens* Donn, ed. 2, 54. 1800, Muhl. Cat. 43. 1813; *Podalyria *virginica* Donn, ed. 4, 94. 1807, Muhl. Cat. 42; *Prunus *depressa* Donn, ed. 4, 114. 1807, Muhl. Cat. 48. 1813; *Pulmonaria *mollis* Donn, ed. 4, 34. 1807, Muhl. Cat. 19; *Rosa *stricta* Donn, ed. 5, 128. 1809, Muhl. Cat. 50. 1813; *Rudbeckia *lobata* Donn, ed. 4, 196. 1807, Muhl. Cat. 78; *Silphium *varians* Donn, ed. 4, 198. 1807, Muhl. Cat. 79; *Viburnum *ulmifolium* Donn, ed. 4, 42. 1807, Muhl. Cat. 32. 1813; *Viola *pygmaea* Donn, ed. 4, 49. 1807, Muhl. Cat. 26; and *Vitis *odoratissima* Donn, ed. 4, 50. 1807, Muhl. Cat. 27. 1813. These for the most part are marked by the sign † in Muhlenberg's "Catalogus," which he used to indicate those species not represented in his herbarium.

There are certain entries in both editions of Muhlenberg's "Catalogus" wherein he erroneously credited various binomials to Donn. These are *Aster altissimus* (that of Miller or Moench intended), *A. glaber* (that of Willdenow intended), *Clematis cylindrica* (that of Sims intended), *Inula aestuans* (that of Linnaeus intended), *Lilium pennsylvanicum* (that of Ker-Gawler intended), *Lythrum triflorum* (that of Linnaeus f. intended), *Menziesia globularis* (that of Salisbury intended), *Pancratium rotatum* (that of Ker-Gawler intended), *Saxifraga pilosa* (that of Haworth intended), *Vaccinium crassifolium* (that of Andrews intended), and *V. parviflorum* (that of Andrews intended). It should be remembered that in all the early editions of Donn's work no authorities are given for the binomials which he listed. It was this usage which doubtless influenced Muhlenberg to adopt the same general plan.

The Descriptio uberior plantarum graminum et plantarum calamarium Americae septentrionalis indigenarum et cicurum

This small volume of 295 pages plus two pages of introduction was published by S. W. Conrad in Philadelphia in 1817, two years after Muhlenberg's death. The title was registered June 12, 1817, and the work appeared before the end of that year, as Rafinesque's review of it was published in December, 1817. The introduction is signed by F. A. Muhlenberg, son of the author. It contains the descriptions of about 380 species and varieties of Gramineae, Cyperaceae, Juncaceae, Typhaceae, and Sparganiaceae. The manuscript was not finished at the time of the author's death and apparently no attempt was made to make it more complete by the editor of the volume. There are about 38 cases where species or varieties are described in various genera but without specific names. Clearly here Muhlenberg was following his own advice to Stephen Elliott because of the great delays he was subjected to in receiving lists of identifications of duplicate specimens that he sent to his botanical correspondents in Europe: "We must depend upon ourselves, make good descriptions, and leave the name to a future day."

Throughout the Muhlenberg unpublished manuscripts that we have seen, and in this published "Descriptio," as well as in both editions of his "Catalogus," one is impressed with his most casual consideration of the authorities for the names he used. Clearly his interest was in the correct names for the plants he considered, and not at all in any "credit" that might accrue to him as the individual who located and first named and described a new genus or a new species. He manifestly would not have been impressed by the critique in Rafinesque's review of the work to the effect that for certain described but unnamed species in his "Descriptio:" "The real author will be deprived of that merit," i.e., the more or less doubtful merit of having named and described such and such a genus or species, a point by which so many modern authors, like Rafinesque, set such great store. As Hitchcock[10] says:

> "In only a few cases are his own species indicated by 'Mihi.' It is therefore difficult to be certain which names are meant to be new and which are old ones misapplied."

We merely comment here that in a considerable number of cases where Muhlenberg described a species, he correctly interpreted this or that entity of his predecessors, Linnaeus, Willdenow, Walter, Michaux, and other botanists. In only a few cases, where he felt reasonably certain in the correctness of his interpretations, did he even bother to cite the authorities, and then in abbreviated form such as L. = Linnaeus; Willd. = Willdenow; and M. or Mich. = Michaux. We assume that he expected it would be understood that he was dealing with this or that species of this or that author when he used a previously published name. We interpret the occasional "H.L." following a species to mean that Muhlenberg had observed the plant in cultivation in his garden at Lancaster (Hortus Lancastriensis), for it is clear from his letters that he grew as many species as he could from seeds received from his correspondents; and he incidentally recommended Elliott to do likewise.

It is therefore difficult in some cases to determine whether Muhlenberg was actually proposing a new specific name when he wrote certain descriptions, or was redescribing a previously proposed species. In some cases synonyms are cited at the ends of the descriptions, but this is an exception rather than a rule. In *Scirpus* where thirty-one species are described, and many of these here described for the first time, we can rather safely assume that where no authority for a name was cited by Muhlenberg, they are as we have added them in the succeeding list: *Scirpus lacustris* Linn., *S. palustris* Linn., *S. acutus* Willd., *S. triqueter* Linn., *S. debilis* Lam., *S. spadiceus* Linn., *S. capillaris* Linn., *S. autumnalis* Linn., *S. castaneus* Michx., *S. echinatus* Linn., *S. retrofractus* Linn., *S. macrostachyus* Lam., and *S. lineatus* Michx.; or at any rate, what Muhlenberg or his European correspondents had identified, rightly or wrongly, as representing this or that species of his predecessors. Hitchcock encountered many difficulties in his detailed study of the grasses in Muhlenberg's herbarium in connection with an examination of the original descriptions. Other groups covered by Muhlenberg as yet lack such a detailed study, except for the ferns.[11] It is inevitable that in some cases, where it is clear that Muhlenberg did not intend that a certain binomial should represent a new species that he was describing, some names assigned to these undocumented descriptions have been entered in standard indices with Muhlenberg as the authority. Such are *Asclepias pulchra* (Barton, Fl. Phila. Prodr. 35. 1815), *A. pulchra* Ehrh. ex Willd. intended; *A. quadrifolia* (Muhl., Cat. 28. 1813), *A. quadrifolia* Jacq. intended; *Aster cyaneus* (Muhl., Cat. 74. 1813), *A. cyaneus* Hoffm. intended; *Carex oligocarpa* (Muhl., Cat. 83. 1813), *C. oligocarpa* Schkuhr intended; *C. riparia* (Muhl., Cat. 84. 1813), *C. riparia* Curt. intended; *Cynanchum angustifolium* (Muhl., Cat. 28. 1813), *C. angustifolium* Pers. intended; *Gerardia glauca* (Muhl., Cat. 58. 1813), *G. glauca* Eddy intended; *Paspalum debile* (Muhl., Cat. 8. 1813), *P. debile* Michx. intended; *Schoenus effusus* (Muhl., Cat. 6. 1813), *S. effusus* Sw. intended; *Scirpus castaneus* (Muhl., Cat. 7. 1813), *S. castaneus* Michx. intended; *S. lineatus* (Muhl., Cat. 7. 1813), *S. lineatus* Michx. intended; and *Spiraea crenata* (Muhl., Cat. 49. 1813), *S. crenata* Linn. intended.

---

[10] **Hitchcock, A. S.** The Grasses of the Muhlenberg Herbarium. Bartonia **14**: 27-52 1932 (p. 29).

Cynanchum angustifolium Pers. Syn. **1**: 274. 1805, is an interesting case, for Muhlenberg seems to have been the only American botanist, other than possibly Nuttall, who has considered it. The type was a specimen collected by the younger Michaux " ad littora maris in Carolina." Since 1805 a formidable synonymy has been built up, including *Ceropegia palustris* Pursh (1814), *Lyonia maritima* Ell. (1817), *Cynanchum angustifolium* Nutt. (1818) (perhaps Nuttall intended *C. angustifolium* Pers.), *Seutera maritima* Decne. (1844), *Amphistelma salinarum* C. Wright (1866), *Metastelma salinarum* C. Wright (1870), *Cynoctonum *maritimum* Maxim. in Bull. Acad. St. Pétersb. III. **21**: 369. 1877 and in Mélang. Biol.

---

[11] **Wherry, E. T.** Notes on Muhlenberg's Ferns. Am. Fern Jour. **36**: 54-58. 1946. Wherry states that Muhlenberg's fern herbarium was acquired by W. P. C. Barton, and that it ultimately passed to the American Philosophical Society; see the discussion of the Muhlenberg herbarium, p. 29. He also states: " Unfortunately Barton lost some of the specimens and destroyed all but one of such labels as there may have been." But see p. 31.

9: 799. 1877, *Vincetoxicum palustre* A. Gray (1878), *Cynanchum *maritimum* Schltr. et Urban, Symb. Antill. **1**: 258. 1899, *Seutera *palustris* Vail ex Small, Fl. Southeast U. S. 952. 1903, *Cynanchum palustre* Heller (1898), and *Lyonia palustris* Small (1913). No matter what generic name be used, the oldest valid specific name is the one assigned to it by Persoon in 1805. The three binomials marked by an asterisk still remain unlisted in standard indices.

A survey of the first 100 species actually included in the " Descriptio " shows that for 7 of the descriptions no specific name is given (there is a total of 38 in the volume in this category including varieties and what he called co-species); that in only 11 cases did Muhlenberg cite the authority for the accepted name; that in only about 29 cases did he cite at the end of the descriptions synonyms that, at least in part, explain the accepted name; that approximately 75 of the accepted names were intended to represent species originally described by such botanists as Linnaeus, Willdenow, Persoon, Michaux, Schreber, Sprengel, Lamarck, Swartz, and a few other early authors (his interpretations of the various species are naturally not always correct, but he was right in the majority of the cases); and again that of the 100 species Muhlenberg actually originated at least 18 of the names which he used.

Muhlenberg was so modest, and so little impressed with what one may call self-advertising, that is, in receiving credit for his new binomials, that of a total of some scores of new species which he characterized in his " Descriptio," in only five cases are the names followed by the word *" Mihi,"* or any other indication that he considered them as new. These are *Panicum verrucosum, Poa obtusa, Poa ? uniflora, Festuca clandestina,* and *Carex dasycarpa.* It would have simplified the work of his successors had he, in accordance with the now generally accepted custom among botanists, clearly indicated those names which originated with him, and had cited the standard abbreviations of the names of those botanists whose specific names he accepted for his redescriptions of their species.

Muhlenberg's posthumously published " Descriptio " was soon reviewed by Rafinesque,[12] proof, if proof be needed, that the volume was off the press well before December of that year. Rafinesque remarks, *inter alia:*

> " But like many posthumous works, it bears the stamp of imperfection: more than forty species [only 38 including varieties and co-species], perhaps new, are published without names! could any one believe that in the present state of science such a blunder could be committed. The author, had he been living, would never have done it, and unless the editor thought that there was *no one* that could rectify this omission, he is inexcusable; but we are certain that many of our botanists would have been very glad to do it, and associate thereby this trifling labour to those of the worthy author. The consequence will be that those new species will be named by Rafinesque, Decandolle, Romer, Leconte, etc., and receive therefore as many different names! while the real author will be deprived of that merit. It is likewise astonishing, that the editor could not, or would not

---

[12] Am. Monthly Mag. Crit. Rev. **2**: 143-144, December, 1817

employ some botanist to compare the species of Muhlenberg, with those of Pursh and Elliott! and frame specific definitions. These and many other omissions and imperfections lessen the value of this otherwise classical work; we shall endeavor to rectify them in a future review."

Undoubtedly Rafinesque considered himself to be thoroughly well qualified to have completed the manuscript by providing the new names for the described but unnamed species of Muhlenberg. Probably it is fortunate that his promise to rectify the faults at a later date was never fulfilled. However he was, in a sense, correct, because in a few cases other botanists, notably Schultes, did select and apply their own specific names to certain of the species that Muhlenberg described without names.

As to the numerous entries in Muhlenberg's "Descriptio" (1817), where binomials are given accompanied with descriptions, even an examination of the actual specimens on which the descriptions were based does not always indicate whether Muhlenberg was describing a new species on his own account, or redescribing what he took to represent a previously described one of some other author. Hitchcock, in his critical notes on the grasses in Muhlenberg's herbarium [13] has in each case added the name of the original author in brackets.

In very many cases Muhlenberg correctly interpreted the species of this or that author. An examination of Hitchcock's entries shows that in approximately 115 cases Muhlenberg so interpreted the species described by his predecessors, which, considering the critical nature of many species of the Gramineae, and the slight differences by which they are often differentiated, is an exceedingly good record, considering the time that Muhlenberg worked and the facilities which were available to him. In less than 30 cases did Muhlenberg misapply a specific name originated by another. In nearly 60 cases Hitchcock has shown that Muhlenberg originated the specific names which he used, and that he is, therefore, the authority for these, a credit that he did not acknowledge except in five cases so far as their being indicated as new species.

Because of the somewhat confused nature of presentation of the published record in the "Descriptio," naturally a considerable number of entries have been made in standard indices with the binomials accredited to Muhlenberg when all that he did was correctly to interpret this or that species originally named and described by his predecessors, as noted above. There are naturally a number of cases where the specimens which Muhlenberg had, do not represent the species of the author indicated, and these, if cited at all, will largely be indicated as "sensu Muhl., non Michx." etc., as the case may be. The number is not large. The original manuscript of this work was presented by the heirs of Zaccheus Collins to the American Philosophical Society, November 18, 1831.

---

[13] **Bartonia 14**: 27-53. 1932.

UNPUBLISHED MANUSCRIPTS

It has long been known that Muhlenberg prepared many botanical manuscripts which were never published, but we doubt if the full extent of his activity in this field is generally realized. In addition to his published works, listed above, and the extensive manuscript on the Lancaster flora discussed below, we find a rather remarkable list of his unpublished documents enumerated in 1890. The first actually published note on the Muhlenberg manuscripts that we have seen is in the entry covering the minutes of the meeting of the American Philosophical Society, July 15, 1785: [14] " Muhlenberg sent his specimen of a *Flora Lancastriensis,* and floral *Calendarium.* Referred to Committee Natural History and Chemistry." The 22 items listed below were presented to the American Philosophical Society by Muhlenberg's grandson, the Reverend F. A. Muhlenberg.[15] These manuscripts are now preserved in the library of the American Philosophical Society, the titles being listed in 1890 as follows:

Botanicae; Book of Descriptions (without title); Plants not Determined, According to Linnaeus System, 1788; " Tage Buch " and " Noten Buch " from 1784 to 1789; Catalogus arborum et fruticum Americae septentrionalis; Cryptogamia Lancastriensis, 1791; Agrostographia Pennsylvaniae; Gräser, die bei Lancaster wild wachsen oder die ich sonst auf meinen inländischen Reisen bemerkte; Plantae cryptogamicae Lancastrienses; Fungi Pennsylvaniae mediae, 1793; Monographien von Gewächsen von Lancaster, 1790 (vol. 1); Monographia plantarum Lancastriensis (vol. 2); Descriptio plantarum ex aliis partibus Americae septentrionalis incepta a 1792; Sammlung von Beiträgen zur Kenntniss der Natur, 1785; Forsetzung meines Journals von Jahren 1799-1806; Botanical Journal, 1807-1815; and Flora Lancastriensis, 1790.

Supplementary to these we find in the library of the American Philosophical Society the following additional manuscripts: Lichenes Lancastrienses (1791); Folio plantarum Lancastriensium (1808), 222 figures; Nachschrift von Bäumen und Stauden die in der Gegend von Lancaster wild oder naturalisert wachsen (1787); Supplementum continens ceteras plantas Pensilvaniae et Americae Septentrionalis; and Floral Calendar (no date). Preserved in the Library of the Academy of Natural Sciences of Philadelphia are four rather thick volumes: one being Observationes botanicae de plantis Americae Septentrionalis, two volumes, 1807 and 1811; the other Fungi Lancastriensis, two volumes dated 1802. The total number of pages in the extant but unpublished Muhlenberg manuscripts that we have seen exceed 6200.

MUHLENBERG'S DESCRIPTIO UBERIOR PLANTARUM LANCASTRIENSIUM

Muhlenberg's descriptive Lancaster Flora, to the preparation of which he devoted much time, was never published. We quote from the first edition of his

---

[14] Proc. Amer. Philos. Soc. **22** (3): 132. 1885.

[15] Op. cit. **28**: 94-95. 1890 (Stated Meeting, March 21, 1890).

Catalogus, p. iv. 1813: " Whether my long promised ' DESCRIPTIO UBERIOR PLANTARUM LANCASTRIENSIUM ' or only an Extract of NON DESCRIPTS, will be published, depends upon circumstances. It has been written in M.S. many years ago, and also a DESCRIPTIO UBERIOR of all other North American Plants which are in my HERBARIUM." The actual publication of technical botanical papers in the United States at the time in which he lived depended largely on whether or not individual authors could supply the necessary funds. We call attention to the fact that the original manuscript of his work on the Lancaster flora was prepared before 1800, for among the Muhlenberg manuscripts in the library of the American Philosophical Society are two volumes, the first dated 1790, entitled " Monographien von Gewächsen von Lancaster," the second entitled " Monographia plantarum Lancastriensis," as well as a third work bearing the title " Flora Lancastriensis."

Attention has been called by the librarian, Herbert B. Anstaett, to a variant draft of Muhlenberg's " Flora Lancastriensis " that survives in the library of Franklin and Marshall College at Lancaster, Pa. " The first 34 pages contain the classified list of plants. Pages 35-40 contain notes on medicinal uses. Pages 42-57 contain various other scientific notes: electrical experiments, tables of weights and measures, heights of mountains, etc."

The manuscript of what is apparently the final copy of the Lancaster flora, but without a title, is preserved in the library of the Gray Herbarium of Harvard University, having been presented by Asa Gray; there is no record as to how he acquired it. Some librarian has pencilled on the first sheet " [Muhlenberg, G. H. E. Florula Lancastriensis]." It is noted by Pritzel, " Thesaurus " ed. 2, 226. 1872, under his number 6504 as: " Ejusdem auctoris opus posthumum: ' Descriptio uberior Florae lancastriensis et americanae ' annis 1817-1818 a bibliopolo Conrad Philadelphiae annuntiatum vix a prele produiit."

On the inside of the cover of volume one of this manuscript is the statement: " Copyright purchased of Dr. F. A. Muhlenberg (son of the Author) for four hundred dollars. S. W. Conrad." [16] Mr. Conrad's place of business was then located at 87 Market St., Philadelphia. He published Muhlenberg's " Descriptio uberior graminum et plantarum calamarium Americae septentrionalis," in 1817, and the second edition of Muhlenberg's " Catalogus " in 1818. It is significant that at the end of the list of scientific works that he offered for sale, on the inside page of the back cover of his edition of the " Catalogus " is the statement " S. W. Conrad expects to publish in the course of the present year (1818) Descriptio

---

[16] Solomon White Conrad, a Philadelphia bookseller and publisher, was born at Germantown, Philadelphia, July 31, 1779, and died there October 2, 1831. He was long interested in botany and in conchology, and it was doubtless his botanical interest, rather than any hope of profit, that induced him to publish certain of Muhlenberg's technical works. In 1870, in dedicating the genus *Conradina* to him, Asa Gray stated: " to the memory of Solomon W. Conrad, the associate of Muhlenberg and other Pennsylvania botanists of the last generation—himself a botanist of no mean acquirements."

Uberior Plantarum Lancastriensium, by Henry Muhlenberg." This plan was never consummated, possibly because the manuscript was somewhat incomplete, possibly because of the cost of printing, and further because the publisher apparently realized that there would not be a very great demand for such a technical work.

The manuscript consists of two bound volumes in Muhlenberg's fine but distinctly clear handwriting. The pages are 6 by 3½ inches in size. There are 1012 pages of practically completed text, but in addition pages 1013 to 1078 have entries at the top of each page consisting of the names of lichens, but with no descriptions. Page 1079 is blank, and the last entry in the book, p. 1080, is merely the word Conferva. There is usually only a single species considered on a page, but occasionally one notes two or even more.

It is apparent that in preparing this final copy Muhlenberg was working on the lichens in 1815, his last finished description being that of *Lecidea pannosa* Ach., but that it was his plan to include on the following numerous blank pages the descriptions of the algae, and close the work with a consideration of the fungi known to him from the vicinity of Lancaster. One notes in various letters to Stephen Elliott his keen desire to receive representatives of the various groups of cellular cryptogams and the delays he was subjected to in securing identifications from European correspondents to whom he had sent duplicate specimens. Thus in a letter dated November 8, 1809, he states regarding the only two letters he had received from Europe in that year: " The other letter was from D. J. Ed. Smith who continues to compare for me the herbarium of Linne, though much too slow." On August 10, 1810, when he recommended that Elliott send his algae to Dawson Turner at Yarmouth, England, for identification, he explained: " Unluckily the gentlemen are very slow in answer and I have waited from 10-15 years for an answer although I received promises yearly, the answer was preparing and almost ready. We must depend upon ourselves, make good descriptions and leave the name to a future day."

The text is wholly in Latin, and the arrangement follows the Linnaean sexual system of classification. There is no explanatory statement, but it is clear that the work was intended to include the descriptions of all species of plants known to the author to occur in the vicinity of Lancaster, in the form of a technical descriptive flora.

For the genera and species of phanerogams and vascular cryptogams the descriptions are, for the most part, practically complete; occasionally a species description appears with only the generic name indicated, it probably being the author's intention to add specific names before publication. As one scans these old descriptions one notes that in general the author did not cite authorities for the names he used and that synonyms are rarely indicated, but that there are rather frequent references to published figures. Probably Muhlenberg himself would not have considered that the text was actually ready for the printer, yet one naturally regrets that a nearly completed manuscript, the first extensive one of its kind by a native born American botanist, and clearly a scholarly work, to the preparation of which the author manifestly devoted much time and energy, never saw the light of day in printed form. Possibly one of the reasons why Mr. Conrad did not publish the work was because the text covering the cellular cryptogams was far from complete; but if the parts covering the flowering plants and vascular cryptogams had been published, the work would have been an important contribution to our knowledge of the flora of the eastern United States and publication would have enhanced Muhlenberg's stature as a botanist. It would have rendered to him the credit that he so richly deserved in the annals of American descriptive botany.

Seldom in the history of systematic botany has any author written so much of which actually so little was published. In some respects this is regrettable for much of Muhlenberg's work was careful and critical. The very fact that two of his three proposed new generic names are accepted by all botanists, the third being retained as of subgeneric rank, and that more than 100 of his specific names are still used in the sense that he proposed them, representing still valid species, speaks highly in favor of his work.

Muhlenberg's documentation is very incomplete. Thus in his "Catalogus" one will note that normally he did not cite authorities for the generic names merely assuming that it would be understood that he was following standard reference works. For the first 500 species (and synonyms) listed there are only 95 cases where the authorities for the binomials are indicated, and at least half of these are associated with the relatively few synonyms given.

Again, as noted elsewhere, his own new names, and perhaps in some cases those proposed by his European correspondents and transmitted to him in lists of identifications, are not indicated as new. This, of course, explains in part why so many of these new names first published in the "Catalogus" escaped detection for so long.

An examination of Muhlenberg's unpublished manuscripts shows that here also documentation is reduced to a minimum. Thus in the first 100 species in the manuscript on the Lancaster flora, in only two or three cases did he indicate the authority for the accepted binomial. However, in about forty cases where he listed synonyms he did cite the authorities for these; and where he had access to published figures in such works as those of Plukenet, Lamarck, Wangenheim, Woodville, Dillenius, Junghans, and the Botanical Magazine, these are cited. In the first 100 species, where the descriptions are complete or nearly so, there are nine cases where no specific name is indicated. Here it manifestly was his intention to add the names when he should have received them from his European correspondents or should have reached a final conclusion on his own part.

Taking the first few names as given in this manuscript, where no authorities for the binomials are cited, it is evident that Muhlenberg's belief was that he was actually describing the species of the author whose abbreviated name we have added in each case; and in most or all of these cases he was correct in his interpretations: *Hippuris vulgaris* Linn., *Callitriche verna* Linn., *C. terrestris* Muhl. (originated by Muhlenberg but first published as *C. terrestris* Raf.), *Blitum virgatum* Linn., *Chionanthus virginica* Linn., *Circaea lutetiana* Linn., *Veronica virginica* Linn., *V. officinalis* Linn., *V. serypllifolia* Linn., *V. beccabunga* Linn., *V. anagallis* Linn., *V. scutellata* Linn., *V. arvensis* Linn., *V. agrestis* Linn., and *V. peregrina* Linn.

If one examines the posthumously published " Descriptio " of 1817, one will note that the printed volume parallels the unpublished manuscript above briefly discussed. The same lack of authorities for most of the accepted binomials, the very sketchy synonymy, or more frequently lack of synonyms, the presence of 38 descriptions of species, co-species, and varieties without technical names (other than the generic name) indicates that at the time of Muhlenberg's death in 1815 the manuscript was not complete. Even for some scores of new species included in it with complete or reasonably complete descriptions, in only five cases did Muhlenberg indicate that he was the authority for the new names. Had he lived it is very doubtful if he would have published the work in the form in which it was presented in 1817. However, the editor and the publisher doubtless thought that it was inadvisable to attempt to complete the manuscript. This is further discussed, p. 18.

CREDIT OR DISCREDIT FOR NEW NAMES

Before criticizing Muhlenberg for his bibliographic shortcomings it is well to survey the situation as to what some of his contemporaries and certain of his successors did up to nearly the middle of the nineteenth century. Thus Walter in his " Flora Caroliniana " (1788) cited no authorities for any of the binomials which he used. He naturally assumed that were he describing *Trillium cernuum* or *T. sessile*, he was merely considering these two Linnaean species. He did, however, indicate his own new binomials by printing their specific names in italics.

But with the very rapid expansion of descriptive botanical work following the Linnaean period, the situation soon became distinctly complicated because of the large number of individual authors concerned. Thus the custom of clearly indicating the authorship of technical names, and more or less definitely indicating the necessary new ones, became rather thoroughly established before the end of the century.

Some early American botanists carefully cited the authorities for the names they used, such as B. S. Barton in his " Flora Virginica " (1812), Bigelow in his " Florula Bostoniensis " (1814), W. P. C. Barton in his " Compendium florae

Philadelphicae" (1818), Darlington in his "Florula Cestrica" (1826), and Beck in his "Botany of the Northern and Middle States" (1833). Eaton in the first three editions of his "Manual" (1817-1822) cited no authorities for the names he used, but in editions four (1824) to eight (1840) authors were indicated, although with an extraordinary percentage of error. Darby, in his "Manual of Botany . . . of the Southern States," 1841 and 1847 editions, cited no authorities, but added them in the 1855 edition. Torrey followed conventional usage by adding authorities in his "Catalogue" of 1819, and in his "Flora" of 1824, but in his "Compendium" of 1826 he gives the binomials without their authorities. Wood in the first edition of his "Class-Book" (1845) gives the authorities for about fifty percent of the binomials he used; but by the time of the 1861 edition he included authorities for most of the names.

Muhlenberg, who manifestly did not deliberately seek credit for the new species he proposed and described, should not be severely criticized, even if his modesty did raise certain problems for his successors. Rafinesque,[17] who apparently prized the credit for his myriads of new names, for he seldom failed to indicate them, might have criticized Muhlenberg as he did Eaton. He noted that Eaton cited no authorities for the names which he used in the first edition of his "Manual" of 1817, and expressed surprise for what he indicated as an unwarrantable omission, closing with the statement: "Let us hope they [Eaton's students] will not be led to believe that Mr. E. is the author of them!"

The only botanist that we know of, the late C. G. Lloyd, who attempted to disclaim the authority for the new binomials he was forced to propose in connection with his descriptive mycological work, did so by crediting them to an imaginary "Professor McGinty;" the descriptive mycologists should have no difficulty in deciding which of their group inspired Lloyd in his selection of the name. We mention this in passing merely to point up the fact that whether we like it or not, the authority for a technical name is an essential part of the record. There is no way of escaping the credit or the discredit unless one wishes to follow Lloyd's uninspired action. And here Stevenson and Cash[18] after Lloyd's death have dispelled his attempt at anonimity by compiling a list of his new names with Lloyd as the authority in each case. Thus the imaginary "Professor McGinty" passes out of the botanical picture even if "McGinty," as an authority for the names of certain species of fungi, is embalmed in the later volumes of Saccardo's "Sylloge fungorum."

NOMINA NUDA

Nomina nuda have no taxonomic standing, and may be entirely ignored; yet in those cases where a technical name was originally used without the vestige of a description, and the original author, or some other botanist, later accepted a name and prepared a description, we cannot help but think that references to the original places of publication of such names are a desirable part of the record. The unfortunate thing is that in many cases these *nomina nuda* are listed in standard indices, but usually such works do not contain entries to the places of later validation of such names; and validation may take the form of an actual description, or be by the citation of explanatory synonyms. We believe that all of the new names first published in Muhlenberg's " Catalogus " should be considered as *nomina nuda* except in those cases where explanatory synonyms are entered. It is true that from the very brief descriptive data included in the tabulation under the floral characters, together with the common names listed, and the data included under the habitat, together with certain descriptive specific names, shrewd guesses can be made as to what was intended by this or that entry. We have, in certain cases, indicated definite, as well as probable or possible reductions, on the basis of such data. We do not accept such brief characterizations as corolla " alb.," inflorescence " long-spiked," and the locality and time of flowering, such as " Pens. fl. Aug." as constituting valid descriptions, although in the past some botanists have accepted certain Muhlenberg binomials on the basis of such meager data. Muhlenberg's method of presentation is well illustrated by plate 1, which is a reproduction of a typical page of the first edition (1813) of the " Catalogus."

---

[17] Am. Monthly Mag. Crit. Rev. **1**: 428. 1817.

[18] **Stevenson, J. A. & Cash, E. K.** The New Fungus Names Proposed by C. G. Lloyd. Bull. Lloyd Libr. **35** (Mycol. Ser. **9**): 1-209. 1936.

It is admitted that there is very little to be said in favor of correcting the places of publication of *nomina nuda*, and furthermore, that little is to be gained by even listing the overlooked ones in this category. Simply because in the past *nomina nuda* have very generally been listed in standard indices we decided to include in this work the overlooked ones that we located in the course of our investigations. In this paper we have listed an approximate total of 300 binomials which were originally published as *nomina nuda*. Of these about 140 were later validated by Muhlenberg himself or by other authors who had access to his herbarium material, either by the provision of actual descriptions, or by the citation of explanatory synonyms.

Illustrative cases where we have not hesitated to reduce certain *nomina nuda*, where no descriptive data were ever published, are *Caltha denticulata* Muhl. = *C. palustris* Linn.; *Campanula aculeata* Muhl. = *C. aparinoides* Pursh; *Heteranthera ovalis* Muhl.=*H. reniformis* Ruiz & Pavon; *Yucca recurvata* Muhl.=*Y. recurvifolia* Salisb.; *Symplocos montana* Muhl. = *S. tinctoria* (Linn.) L'Hérit., and *Thalia caerulea* Muhl. = *T. dealbata* Fraser. For other reductions of *nomina nuda* we have depended largely on the published record, for fortunately various early American botanists actually examined the material in the Muhlenberg herbarium and based their reductions on this material.

VALIDATION OF NOMINA NUDA

As noted above not infrequently a name that originally appeared as a *nomen nudum,* in the publication of this or that author, may be accepted by a contemporaneous or later botanist and validated by either having a description provided or by adding the necessary explanatory synonym or synonyms. To locate these validations in botanical literature is a slow process, involving an inordinate amount of time-consuming library work.

Muhlenberg did publish a great many new binomials strictly as *nomina nuda* in his papers of 1793, 1799, 1813, and in the posthumously published second edition of his " Catalogus " in 1818. It is true that some authors, in the past, have accepted certain of these names as validly published, but descriptive data are lacking. Sometimes these names are characterized as being *nomina subnuda,* but this impresses us as begging the question.

In the first two papers and in the two editions of the " Catalogus," certain of Muhlenberg's new binomials are validly published because in these cases he cited the necessary synonym or synonyms, making it clear just what he intended his new name to represent. Thus on page 18 of the first edition of the "Catalogus," reproduced as plate 1, *Galium brachiatum* Muhl. is validly published because *G. circaezans* Michx. is given as a synonym; *Galium brachiatum* Muhl. was proposed merely as a new name for Michaux's species.

The *Bartonia verna* and *B. paniculata* cases, discussed on p. 25, may be considered as of somewhat doubtful " publication " as to actual validity, because in neither case was the name-bringing synonym cited, these being *Centaurella verna* Michx. and *C. paniculata* Michx. The fact that he did cite the generic name *Centaurella* as a synonym of his new name *Bartonia* (actually *Bartonia* Muhl. was published as a new name for *Centaurella* Michx., 1803, non Delarb., 1800) indicates this. The generic name *Bartonia* is validly published, but it is only by inference that the two specific names fall in this category.

From time to time botanists here and there have accepted certain of Muhlenberg's *nomina nuda* in the sense that he applied them, and have provided the necessary descriptive data or added the necessary explanatory synonyms thus effecting validation. In a number of cases such botanists as Bigelow (1814), Barton (1815), and Elliott (1816) validated certain Muhlenberg *nomina nuda* before the latter's actual descriptions were posthumously published in 1817. We cite a few illustrative cases from the many appearing in the body of this work:

Agrostis decumbens Muhl. 1813, *nom. nud.*; Muhl. ex Barton, 1815, *descr.*; Muhl. ex Elliott, 1816, *descr.*; Muhl. 1817, *descr.*

Agrostis sericea Muhl. 1813, *nom. nud.*; Muhl. ex Elliott, 1816, *descr.*; Muhl. 1817. *descr.*

Agrostis sobolifera Muhl., 1799, *nom. nud.*; Muhl. ex Willd. 1809, *descr.*

Aira mollis Muhl. 1813, *nom. nud.*; Muhl. ex Elliott, 1816, *descr.*; Muhl. 1817. *descr.*

When one finds that it is desirable to locate the first place where an original *nomen nudum* may have been validated by a contemporaneous or later author, it is often like searching for the proverbial needle in a haystack. Only the original place of publication of the name is included in standard indices, not the place where such names were later validated. It becomes necessary to scan a vast amount of contemporaneous and later literature covering the work of both European and American botanists if one desires to be reasonably certain as to where descriptions of certain of Muhlenberg's species were first published. The standard European works of the first half of the past century are involved, and with us, those of Bigelow, W. P. C. Barton, Nuttall, Elliott, Eaton, Torrey, Rafinesque, Gray, Beck, Darlington, Chapman, Wood, and others. There are various cases of correctly listed *nomina nuda* of Muhlenberg, which are outside of the scope of this paper, where the actual validations of the names appear to be as follows:

Castanea nana Muhl., *nom. nud.*, 1813, validated by Elliott, 1824.
Cerastium hirsutum Muhl., *nom. nud.*, 1813, validated by Barton, 1815.
Galium pennsylvanicum Muhl., *nom. nud.*, 1813, validated by Barton, 1815.
Geum hirsutum Muhl., *nom. nud.*, 1813, validated by Barton, 1815.
Impatiens maculata Muhl., *nom. nud.*, 1813, validated by Barton, 1815.
Thalictrum polygonum Muhl., *nom. nud.*, 1793, validated by Barton, 1815.

We note that currently the validation of the last name is credited to Sprengel, Syst. Veg. **2**: 671. 1825. Dr. Boivin[19] notes that Muhlenberg's binomial, which he accepted, is antedated by two, perhaps by four validly published earlier ones, *T. corynellum* DC. (1817), *T. divergens* Link (1822), *T. pubescens* Pursh (1814), and *T. purpurascens* Linn. (1753), but he conservatively retained *T. polygonum* Muhl. as validated by Sprengel in 1825 explaining that although he realized that the name which he accepted was not the right one for the species " it seems preferable to keep it until we make sure of the right one to take." From this discussion, in view of the fact that Barton actually published sufficient descriptive data in 1815 more or less definitely to characterize Muhlenberg's species, two of the above names may now be eliminated, that of DeCandolle in 1817 and that of Link in 1822, as both are antedated by Barton's description of *Thalictrum polygonum* Muhl. in 1815; this leaves only *T. purpurascens* Linn., 1753, and *T. pubescens* Pursh, 1814, as possible older names than that of Muhlenberg for this particular species.

DIFFERENCES IN INTERPRETATIONS

There are some cases where there may easily be differences of opinion in the interpretation of certain Muhlenberg entries. Thus *Anthoxanthum* " giganteum Walt. v. erianthus " and *Erianthus* " giganteus, *Andropogon alop.* L." on page four of both editions of the " Catalogus " is a case in point. Fernald[20] strongly disagrees with Hitchcock as to what was intended or consummated. As to the entry under *Anthoxanthum* he says: " It is perfectly clear that Muhlenberg was maintaining Walter's *Anthoxanthum giganteum* under *Anthoxanthum!* though with the rather vague intimation ('v. [vel] erianthus') that perhaps it was an *Erianthus*." On the basis of the evidence Fernald was too positive and we accept Hitchcock's interpretation; in any case "perfectly clear" is too strong an expression, in spite of the fact that, to prove his point, Fernald reproduced the entries from both editions of the "Catalogus."

---

[19] Rhodora **46**: 475, 478. 1944.

[20] Rhodora **45**: 249-251. 1943.

We admit that Muhlenberg was slightly inconsistent in the use of the abbreviation "v." but we believe that the "v." was intended in this case as an abbreviation for *vide* (not for *vel*) to save space. In other cases where he used the word he spelled it out in full, *vide*, as *Polemonium* "dubium *vide* phacelia," p. 33; *Erigeron* "nervosum *vide* Inula graminifolia," p. 76; *Verbena* "nodiflora *vide* Zapania," p. 57; these are the only cases that we have noted.

In a very few cases he manifestly did use the "v." for *vel*, all we have noted being *Plantago* "media v. crassifolia," p. 16; *Hypericum* "simplex v. villosum," p. 28; *Ceanothus* "intermedius v. corymbosus," p. 25; and in edition 2, 68, the entry under *Phaca* is "*Aeschynomene v. Sesbania platycarpa*." His normal procedure when he wished to express the equivalent of the English word "or" was to use "s." = *sive* or *seu* instead of "v." = *vel*, such as *Convolvulus* "speciosus s. Wheleri," p. 22, and similar entries under *Achillea, Amorpha, Andromeda, Andropogon, Asclepias, Cnicus, Gerardia, Hydrangea, Laurus, Prenanthes, Rhus,* and *Rosa*.

We note further that for the *Anthoxanthum giganteum* entry *Muhlenberg cites no locality,* but under *Erianthus giganteus* he says "Car. Virg." Perhaps the strangest oversight of all on the part of both Hubbard[21] and Fernald, who both considered the *Erianthus giganteus* case, is that apparently both overlooked the fact that in 1817 Muhlenberg actually published a detailed description of *Erianthus giganteus* Muhl. Descr. 192. 1817, from "Carolina et Virginia," stating at the end of the description: "Summa affinitas cum *Andropogone alopecuroides*." He did not cite any name-bringing synonym, i.e., *Anthoxanthum giganteum* Walt., but this was not normally his custom; see p. 19. At any rate there was no need of the new combination *Erianthus giganteus* (Walt.) Hubb. of 1912, for Muhlenberg's description of 1817 under *Erianthus* had ninety-five years priority. We believe, with Hitchcock, that Muhlenberg did, in 1813, validly, even if confusedly, publish the transfer of Walter's specific name from *Anthoxanthum* to *Erianthus*, for otherwise he would scarcely have prepared a full description of *Erianthus giganteus* Muhl. which was published a few years later. How easy it is, in cases like this, to become involved in interminable discussions, some of which, like Fernald's, at times become somewhat acrimonious.

In the case of *Bartonia paniculata* (Michx.) Muhl., it is only by assumption that valid "publication" of the binomial was effected by Muhlenberg in 1813, although the publication of the generic name was valid as noted above. In 1908

---

[21] **Hubbard, F. T.** Rhodora **14**: 166. 1912: **Fernald, M. L.**, op. cit. **45**: 249-251. 1943.

B. L. Robinson[22] republished the binomial as *Bartonia paniculata* (Muhl.) B. L. Rob., but Fernald and Weatherby[23] accepted it as *Bartonia paniculata* (Michx.) Muhl., with a reference to the "Catalogus" entry of 1813; yet nowhere did Muhlenberg cite the name-bringing synonym, *Centaurella paniculata* Michx. Merrill and Reeder[24] discussed this case, calling attention to the fact that in 1822 Eaton in the third edition of his "Manual" not only provided a description but also cited the name-bringing synonym, *Centaurella paniculata* Michx. We add that Bigelow[25] cited *Bartonia paniculata* Muhl. as a synonym of *Centaurella paniculata* Michx. and a year later Barton[26] did likewise. A glance at the reproduction of page 16 of Muhlenberg's "Catalogus," plate 1, clearly indicates the situation. One suspects that if any modern author so sketchily published a transfer, that it would not be accepted as valid under any circumstances, especially in view of the requirement now in vogue that not only the name-bringing synonym must be given, but also the reference to its original place of publication.

MUHLENBERG AND RAFINESQUE

During the time of Rafinesque's first residence in Philadelphia, 1802-1804, Muhlenberg was acquainted with him, and, as with other botanists of the time, he provided him with named specimens from his herbarium. Rafinesque's treatment of Muhlenberg was not too generous or too ethical, for we note in the latter's letter of June 16, 1809, addressed to Stephen Elliott, the following statement:

> "Have you seen what Mr. Rafinesque Schmal[t]z had printed in the New York medical Repository and what he promises to publish hereafter? He makes a wonderful change and havoc amongst our plants and will do much harm if he keeps his promise. I know him personally and find a great number of my plants which I gave him superficially described without mentioning a word from whence he had them. Very often he makes a new genus where hardly a species can be made and where his specimen was imperfect. There is a medium in everything, in Botany the festina lente is very necessary."

Thus it is, as with the more numerous Pursh binomials, that if one compares Muhlenberg's entries with those of Rafinesque, one will note some cases where the same specific name was used independently by both to designate the same species. The most curious case is that of *Callitriche terrestris*, a binomial that was certainly originated by Muhlenberg. In 1808 Rafinesque published it as *Callitriche terrestris* Raf., in 1811 as *C. terrestris* Muhl., and in 1817 as *C. terrestris* Raf. & Muhl. *Frasera verticillata* Muhl. (1813), *nom.*, was published as *F. verticillata* Raf. in 1828. *Spiraea corymbosa* Muhl. *nom.* (1813), probably represents the same species as *S. corymbosa* Raf. (1814). *Vitis verrucosa* Muhl. (1813), *nom.*, appeared as *V. verrucosa* Raf. in 1830; and *V. labruscoides* Muhl. (1813), *nom.*, was accepted by Rafinesque in 1830 as *V. labruscoides* "Mg. [Muhlenberg] and Raf." It may be that in some cases it was merely by chance that the two authors applied the same specific name independently to the same species, but the suspicion is that in perhaps all cases Rafinesque merely appropriated the name that Muhlenberg had placed on duplicate specimens he had given him.

---

[22] Rhodora **10**: 35. 1908.

[23] Op. cit. **34**: 165. 1932.

[24] Bartonia **24**: 52. 1947.

[25] Florula Bostoniensis 34. 1814.

[26] Florae Philadelphicae prodromus 25. 1815.

Muhlenberg and Pursh

In the more numerous cases where Muhlenberg and Pursh independently published the same binomial, and in each case presumably for the same species, we were at first undecided as to whether we should indicate the unlisted Muhlenberg names by an asterisk, or use the sign † with the citation [Pursh] ex Muhl. Cat. Although we cannot now prove that Muhlenberg originated all of these names we finally decided to mark them with an asterisk. Muhlenberg was acquainted with Pursh during the years that the latter lived in Philadelphia (1799-1808), and they exchanged botanical material. The number of cases is so large that the duplicate use of so many specific names could scarcely be accidental. In at least one case, *Justicia brachiata,* Muhlenberg in recording this name cited its authority as Pursh; there may be other cases where Pursh originated the name but where Muhlenberg, following his usual practice, cited no authority in his "Catalogus." If one will compare the entries in Muhlenberg's "Catalogus" (manuscript 1809, publ. 1813) with those in Pursh's "Flora" (1814), one will note that in practically every case the geographic range as given by one, conforms closely or exactly with that given by the other; the manuscript for the "Catalogus" was completed in 1809 or four years before it was finally published. The cases are *Conyza camphorata* Muhl. (1813), Pursh (1814); *Corydalis formosa* Muhl. (1813), Pursh (1814); *C. glauca* Muhl. (1813), Pursh (1814); *Euonymus angustifolius* Lyon ex Muhl. (1813), Pursh (1814); *Amsonia salicifolia* Muhl. (1813), Pursh (1814); *Andromeda floribunda* Muhl. (1813), Pursh (1814); *A. frondosa* Muhl. (1813), Pursh (1814); *Aster ledifolius* Muhl. (1813), Pursh (1814); *Ceanothus intermedius* Muhl. (1813), Pursh (1814); *Cnicus muticus* Muhl. (1813), Pursh (1814); *C. virginianus* Muhl. (1813), Pursh (1814); *Heuchera hispida* Muhl. (1813), Pursh (1814); *Laurus diospyrus* Muhl. (1813), Pursh (1814); *Linum lewisii* Muhl.[27] (1813), Pursh (1814); *Marshallia angustifolia* Muhl. (1813), Pursh (1814); *M. lanceolata* Muhl. (1813), Pursh (1814); *M. latifolia* Muhl. (1813), Pursh (1814); *Phacelia parviflora* Muhl. (1813), Pursh (1814); *Prinos laevigatus* Muhl. (1813), Pursh (1814); *Prunus*

---

[27] Perhaps Pursh originated this binomial for he had the Lewis and Clark expedition collections for study; but Muhlenberg had seeds and actually grew this species in his garden.

depressa Donn (1807), Donn ex Muhl. (1813), Pursh (1814); *Sagittaria heterophylla* Muhl. (1813), Pursh (1814); and *Scirpus debilis* Muhl. (1813), Pursh (1814). It is perhaps worthy of note that when Pursh[28] did not accept a Muhlenberg species as valid, he sometimes cited the names in synonymy, as "*Polypodium pensylvanicum Muhl. in litt.*" and "*Polypodium pilosiusculum Muhl. in litt.*," in such cases clearly indicating the authorship.

We suspect that in most cases Pursh had seen actual specimens named by Muhlenberg, and when he came to prepare his manuscript that he merely appropriated the new species as his own, in view of the fact that Muhlenberg had never published descriptions. One should note that Muhlenberg's listings were named at least as early as 1809, or five years before Pursh's work was published. Pursh was not obligated to accept merely herbarium names, but most botanists follow the ethical rule of accepting and publishing the name of the originator of a new one, crediting the species to him. However, there is much evidence that Pursh's ethics were not of a very high order. Rafinesque expressed himself in no uncertain terms regarding Pursh's pilfering of certain of his new species. Thus[29] regarding *Drosera filiformis* Raf. (1808) versus *Drosera filiformis* Pursh (1814): "The *Drosera filiformis* was discovered in 1802 by C. S. Rafinesque in a journey to the sea-shore of New Jersey, in company with Col. Thomas Forrest, communicated in 1803 to Dr. Muhlenberg, to Mr. Hamilton, to whom Mr. Pursh was then gardener, and to Mr. Pursh himself, and published in 1808 in the Medical Repository, in 1809 in the Journal of Botany, &c., nevertheless, Mr. Pursh introduces it in his Flora, in 1814! as a new species, under the same name, stating that he had discovered it in the same place, near Tuckerton, in 1805! and without noticing in the least the above circumstances." A year later[30] in discussing the same binomial he pointedly stated that "Pursh . . . pilfered from him [Rafinesque] the plant and the name." And even more baldly;[31] "Pursh, in 1814, stole this plant from me." Apparently botanical piracy isn't a modern phenomenon.

Some of the Muhlenberg names of 1813, listed above, are validly published, and in these cases, as far as the names are now accepted as valid, Muhlenberg should replace Pursh as the authority. On the other hand many are strictly *nomina nuda*, and in these cases Pursh, who provided the first published descriptions in each case, is the legitimate author of the binomials. While Pursh was more or less familiar with what Muhlenberg was doing, up to the time he left Philadelphia, we merely call attention to the fact that the period involved was a very unsettled one, due to hostilities between the United States and Great Britain; from 1812 to 1814 intercommunication between residents of the two countries was impossible or was severely restricted. There is no reason to believe that Pursh, up to the time he had finished his manuscript, had any knowledge of the actual publication of Muhlenberg's "Catalogus" in October, 1813, and Muhlenberg never saw a copy of Pursh's "Flora," if we may judge by his letters to Elliott up to April 10, 1815 (Muhlenberg died May 23, 1815), for he kept Elliott posted on the new botanical works that he received from Europe. He knew that the text of Pursh's "Flora" was being prepared for he mentions it in his letter of October 10, 1814. According to W. P. C. Barton[32] copies of Pursh's work had not been received in Philadelphia up to October 1, 1815. From Muhlenberg's letter we quote:

---

[28] Flora Americae septentrionalis **2**: 664, 671. 1814.

[29] Am. Monthly Mag. Crit. Rev. **2**: 174. 1818.

[30] Op. cit. **4**: 191. 1819.

[31] Loudon's Gard. Mag. **8**: 246. 1833.

> "We may expect a new work published in England in 2 volumes, flora Americana Pursh. I know Mr. Pursh personally. He is a good botanist and he has had an excellent opportunity to examine Clayton's and even Linne's Herbarium and so many botanical gardens I expect a great deal, but still a great part of our plants are untouched."

Finally in his last letter to Elliott, dated April 10, 1815, Muhlenberg states:

> "Mr. Pursh has published his Flora. He has seen Walter's Herbarium with the Fraser's, also Clayton's and many others in England. Without doubt we shall see it soon in the book stores here and you will be able to explain many dubious plants and new plants omitted by Walter and Michaux. Figures are given to more than 25 plants."

Perhaps Pursh considered that he was a much better authority on the flora of North America, working as he later did in England, where he had access to extensive collections of historical material, than was an obscure clergyman resident in such an out of the way place as Lancaster, Pennsylvania. We have Muhlenberg's own word for it that Rafinesque actually did appropriate some of his (Muhlenberg's) binomials as his own, but we have not found any reference, other than casual ones, to his relationships with Pursh. The number of cases of the duplication of specific names in this Muhlenberg-Pursh episode is too great to warrant an explanation on the basis of mere chance.

Muhlenberg's Herbarium

The Muhlenberg herbarium, apparently the first really large one assembled by a native-born American botanist, is the property of the American Philosophical Society and is now deposited, as a separate collection, at the Academy of Natural Sciences of Philadelphia. The material is unmounted. There is one small special collection, purchased from Dr. Muhlenberg's son, Dr. F. A. Muhlenberg, by Dr. W. P. C. Barton, and presented by him to the Philosophical Society, April 28, 1831, and the much larger general Muhlenberg herbarium. Barton's note regarding the small herbarium is reproduced by Hitchcock in his paper on Muhlenberg's grasses referred to below. The larger general herbarium was also purchased from Dr. Muhlenberg's son by a group of nine donors, Messrs. Zaccheus Collins, Nathaniel Chapman, J. S. Dorsey, George Pollock, Thomas C. James, William Short, William Tilghman, John Vaughn, and Caspar Wistar. The actual minute reads, in part: " Muhlenberg's Herbarium costing ' upwards of 500 dollars ' was received as a donation to the Society ' under terms hereafter to be made known.' " Then follow the names of the actual donors with the supplementary statement " [The names of N. Biddle, H. Binney and C. Chauncey appear faintly preceding the others, and seem to have been erased.] Presented by them to the Philosophical Society, February 20, 1818." [33]

---

[32] Florae Philadelphicae prodromus vii. 1815.

The small collection is that part of Muhlenberg's herbarium associated with his posthumously published " Descriptio uberior graminum et plantarum calamarium Americae septentrionalis," a work that was apparently off the press as early as June, 1817. This was subsequent to the publication of pages 1 to 296 of volume one of Elliott's " Sketch of the Botany of South Carolina and Georgia; " Elliott actually published some of Muhlenberg's species, for they were in close correspondence with each other and exchanged botanical specimens on a rather large scale; see p. 35.

This special herbarium, the only part of Muhlenberg's collection still remaining as he left it, is limited to the Cyperaceae, the Gramineae, and the Juncaceae. The folders containing the specimens are about 9 by 11 inches. The specimens, for the most part small, are loose in the folders. In some cases there are several species in a folder; they are usually unaccompanied by labels or notes. The folders are sewed together like the signature of a book, with an accompanying numbered list of the species, the corresponding numbers being written on the folders. These numbers extend from 1 to 414. The names actually published in Muhlenberg's " Descriptio " are not always the same as those on the herbarium lists.

The Gramineae were examined by the senior author in 1899,[34] at the beginning of his short career as Assistant Agrostologist in the United States Department of Agriculture, and much more intensively by Hitchcock [35] in 1932. The senior author considered only about 90 selected species, while Doctor Hitchcock critically studied all of the North American grasses in the collection, totalling about 220 species in Muhlenberg's " Descriptio." For the association of the Muhlenberg species with those described by other authors, Hitchcock's work should be consulted.

---

[33] Proc. Am. Philos. Soc. **22** (3): 478. 1884. Part three, no. 119 of this volume is devoted to the publication of the manuscript minutes of the meetings from 1744 to 1848.

[34] **Scribner, F. L. & Merrill, E. D.** The Grasses of the Muhlenberg Herbarium. U. S. Dept. Agr. Div. Agrost. Circ. **27**: 1-6. 1900.

[35] **Hitchcock, A. S.** The Grasses of the Muhlenberg Herbarium. Bartonia **14**: 27-52. 1932.

Both this and the much larger general Muhlenberg herbarium were still preserved in the original book-like boxes when Doctor F. W. Pennell took charge of the herbarium of the Academy of Sciences in 1921. Both series consisted of specimens collected by Muhlenberg and of American and foreign material sent to him by various correspondents in eastern North America and in Europe. We are informed by Doctor Pennell that Mr. R. Eglesfield Griffith, one of the curators of the Philosophical Society " put the collection into good order " about 1830. This was very unfortunate, the result being that only occasional records in Muhlenberg's handwriting survive. Perhaps one of the objectives was to prepare the technical names in a more legible script, although Muhlenberg's distinctly small handwriting is remarkably clear. Doctor Pennell also informs us that he suspects, from an earlier mention of the herbarium by William Baldwin,[36] that there never were many data with the specimens. The extensive Muhlenberg manuscripts contain very numerous lists of numbered specimens received from his many correspondents. It may be assumed that the numbers and the collector's names were originally associated with the actual specimens in the herbarium. However, if this was the case, the ordering up of the collection, about 1830, resulted in the elimination of most of these data. Often small slips bearing numbers are associated with the specimens but rarely is any collector's name indicated. Thus it is in general difficult to determine which specimens were collected by this or that individual—Elliott, Baldwin, Nuttall, etc., or even by Muhlenberg himself, or when or where they were collected. From the lists of identifications in Muhlenberg's unpublished manuscripts, such as those of numbered collections sent to him by Baldwin, Elliott, and others, it would be possible, in many cases, to add the collector's names and perhaps the approximate localities for many of the specimens, but this would be a very critical and time-consuming task. Muhlenberg could scarcely have depended on his memory as to localities and collectors, and if such data were originally associated with the specimens the only conclusion that we can draw is that they were eliminated when the herbarium was " ordered up " by Mr. Griffith about 1830.

This herbarium has been rearranged, the specimens, still loose on the thin sheets, now being in the sequence of the numbered genera of Muhlenberg's " Catalogus." The material is now stored in standard herbarium cases. There is doubtless much of historical value in this herbarium, including some or perhaps most of Muhlenberg's actual types, as well as isotypes of eastern North American species described by Willdenow and others on the basis of duplicate specimens sent by Muhlenberg to his European correspondents. Likewise there should be important material that would help in elucidating species described by Elliott (1816-1824), for Muhlenberg's letters to Elliott indicate that the latter sent about 900 plant specimens to him. Muhlenberg also received very extensive collections made by Dr. Baldwin in Georgia. Some of the foreign material may also prove to be of distinct value, including as it does specimens representing early European and Asiatic collections.

---

[36] **Darlington, W.** Reliquiae Baldwinianae . . . 1-346. 1843. This work incidentally contains a great many letters written by Muhlenberg to Baldwin from January 7, 1811 to May 11, 1815, and Baldwin's letters to Muhlenberg.

In spite of the early lack of critical care of this herbarium we cannot fully subscribe to Harshberger's statement of 1899. He says in his "Botanists of Philadelphia," p. 96, that when the herbarium was presented to the American Philosophical Society in February 1818: "It was then in good condition, but has, unfortunately, being [been] allowed to suffer from neglect until it is no longer of any value." In spite of the well-intentioned but ill-conceived attempt of a former curator to "put it into good order" which apparently did result in the loss of certain original data, and perhaps in some mixtures of specimens and their names, there are still many historical specimens in the herbarium; certainly the statement: "it is no longer of any value" is much too strong. It is possible that some important specimens in the herbarium were destroyed by herbarium beetles, during the many years that it apparently remained in dead storage and was rarely consulted. The record is clear, however, that some of Muhlenberg's contemporaries and successors, such as the two Bartons, Darlington, Nuttall, Le Conte, Torrey, and others, did consult the Muhlenberg herbarium in connection with their studies.

The actual types of certain Muhlenberg species, the descriptions of which were published in his name by his European correspondents, will naturally be found in European herbaria. The most important was the Willdenow herbarium at Berlin. This special collection, as a measure of safety, had been stored in an abandoned mine in Thuringia during the early part of the second world war and thus escaped destruction when the herbarium building at Dahlem was destroyed on the night of March 1-2, 1943, in a bombing raid, in which the greater part of the historically very rich Berlin herbarium and its accompanying library was lost. Following the close of hostilities it was reported that the Willdenow herbarium, and such other parts of the collections as had been moved from Berlin for storage during the war, had been appropriated and "moved to the east," but in the latter part of 1947 it was all returned to Berlin. It is estimated that perhaps as many as 500,000 specimens were thus saved. Presumably, however, there was in the original Muhlenberg herbarium duplicate types of most of the species which were actually published in Germany by Willdenow and others.

Comments on early herbarium practices

As we consider the prevalent herbarium practices of a century or more ago, or less for that matter, we are impressed by the meager data that were preserved with the specimens. Doubtless this was a reflection of the attitude of Linnaeus, for in his herbarium about the only records that appear on the faces of the herbarium sheets are the technical names of the plants. If other data were preserved they appear on the verso of the sheets and usually in exceedingly abbreviated form, often even reduced to cryptic signs. The idea of the printed label developed later. Muhlenberg apparently followed the general practices of the time, using no herbarium labels.

Pennell[37] has discussed this matter in connection with the large Schweinitz herbarium which was bequeathed to the Academy of Natural Sciences of Philadelphia in 1835. It was estimated to contain about 23,000 species of plants including those collected by himself and those received from his correspondents; and the record shows that he had a much more extensive series of botanical correspondents than did Muhlenberg, over 100 individuals[38] in various parts of the world. As Pennell expresses it:

> " Nuttall could cross a continent, and be content with ' R. Mts.' as the datum for his species gathered in what is now Southern Wyoming and Idaho. Schweinitz was content to let ' Sal ' stand for whatever plants he had gathered while at Salem, North Carolina. . . . Similarly ' Beth ' denoted whatever he had gathered while living at Bethlehem, Pennsylvania. But more amazing still was his treatment of the specimens received from his distinguished contemporaries.
>
> " On the list [of Schweinitz's botanical correspondents] are well known botanists both of America and Europe, and he received collections so valuable as those that Baldwin had gotten in Georgia, Elliott was gathering in South Carolina, Ledebour had procured in the Altai region of central Asia, Sprengel in Germany, and Wallich in India. The specimens of all collectors were treated alike, their original labels uniformly discarded, and the abbreviations of collector and country written upon the rough paper folder. Often these abbreviations became cryptic signs. . . . "

" There is nothing new under the sun "

We have used the above ancient aphorism as the heading for this short statement because, in 1915, the senior author[39] published a short article on the utility of carbon rubbings of the vegetative parts of plants as an aid in herbarium work. A better title would have been a simplified method of making carbon impressions, for the only original contribution in this paper was to call attention to the fact that modern commercial carbon paper could be used to advantage; for with the original method each operator had to smoke his own carbon paper over a candle flame as needed. As a matter of fact the method was known at an early date, and there is a very extensive published literature on the subject of making nature prints; Dr. Frans Verdoorn called our attention to the many references that he had assembled to the various methods used. As early as 1790, Hoppe[40] gave a detailed description of his method of making carbon nature prints of plants through the use of smoked paper. The excellent plates in his book are reproductions of prints that he made by his method; doubtless the method was known and used long before Hoppe's book was published. In the middle decades of the last century, the method, with various modifications, was very extensively used in Europe for preparing illustrations of plants and of parts of plants for publication. In general, however, the herbarium botanists never used it very extensively in spite of its simplicity and eminent practicability. We judge that the rapid decline of its use was due to development of photographic processes in the nineteenth century.

---

[37] **Pennell, F. W.** The Botanist Schweinitz and His Herbarium. Bartonia **16**: 1-8. 1934.

[38] A list of the contributors prefaced to a catalogue of the Schweinitz herbarium that was subsequently discovered at the Academy of Natural Sciences of Philadelphia, includes the names of 108 persons. F. W. P.

[39] **Merrill, E. D.** A Simple Method of Making Carbon Leaf Impressions. Torreya **15**: 175-181, *fig. 103.* 1915.

On the back of one of Muhlenberg's letters to Elliott, dated February 1, 1811, is a beautifully prepared carbon rubbing of the leaves of a certain species which was apparently prepared by Muhlenberg to give Elliott some graphic idea of what the leaves looked like as to size, venation, and marginal teeth. One judges that in modern times this method of reproducing leaf forms, once very extensively used, had by the beginning of the present century largely been forgotten, photography taking its place; and yet a good carbon rubbing of a leaf will not infrequently give a better idea of certain characters of the leaves of plants than will the clearest photograph. The senior author's attention was originally called to the method by Mr. N. E. Brown at Kew, in 1907, who then occasionally used it to prepare impressions of the leaves of aroids when he wished to preserve a leaf outline for future reference.

Evidence as to the critical nature of Muhlenberg's work

Muhlenberg is the authority for a few new generic names and many new binomials for North American plant species, but in many cases his descriptions were published for him by other authors to whom he sent specimens and manuscript descriptions, notably by Willdenow, Schkuhr, and other botanists in Europe. *Bartonia* Muhl. and *Elliottia* Muhl. are two generic names that he originated, both of which are universally accepted by all botanists; his third new genus, *Atheropogon* Muhl. is now placed as *Muhlenbergia* Schreber, subgen. *Atheropogon* (Muhl.) Endl. Universally accepted by all botanists are somewhat more than 100 specific names of North American plants, for which Muhlenberg is the authority, which is a remarkably high percentage of those proposed by him for which actual descriptions were published. This is in very striking contrast to the erratic work of Rafinesque, where with nearly 9,500 validly published new generic and specific names, less than two percent have been accepted. This indicates that Muhlenberg, whose motto in botany, as expressed in his letters to Elliott was *festina lente,* was conservative, and shows moreover that he was not only a keen observer, but also a distinctly critical worker. He was perhaps the most scholarly native American botanist of his time as well as an individual who devoted his energy to the technical aspects of systematic botany rather than to the more practical phases of the subject. He was not content to base his conclusions on a study of herbarium specimens alone, but as evidenced by statements included in his correspondence with Elliott, actually grew hundreds of species in his garden where he could observe them as living plants, and he recommended Elliott to do likewise.

---

[40] **Hoppe, D. H.** Botanisches Taschenbuch. 1-182. *pl. 1-2.* 1790.

We do not claim that Muhlenberg's botanical work was perfect, nor that his concepts as to specific limits, nor his nomenclatural conclusions, were always correct. It would be a very simple matter to criticize some of his methods and certain conclusions that he reached. We maintain that any potential critic working in a modern institution that possesses great library and herbarium resources should be the last to criticize Muhlenberg if consideration be given to the conditions under which he worked and the limited amount of botanical literature and herbarium material that was available to him. He was self-trained in botany, and his personal financial resources were limited. To a high degree he had to depend on his own efforts. Commencing about 1780, through his own personal efforts, he assembled in the following 35 years the largest private or institutional herbarium in North America up to 1815, and also copies of the reference works essential to his needs.

The pioneer is always at a disadvantage, and Muhlenberg was the pioneer native-born American botanist who limited his field very largely to problems of taxonomy. Over a period of approximately thirty-five years, and never with institutional support, he persistently continued his botanical work because of his deep personal interest in it. Through his own efforts, although resident in a small and somewhat remote colonial town, he attained international eminence in the field of systematic botany. It is one thing to initiate botanical work in centers where great collections and library resources are available and institutional support is provided; it was, in Muhlenberg's time, quite another matter to pioneer in almost strictly taxonomic work on a flora that was relatively little known, one not covered by descriptive texts other than two editions of the pre-Linnaean " Flora Virginica " of Gronovius (1739, 1762), the very limited " Flora Caroliniana " of Walter (1788), and, after 1803, the more extensive but still very incomplete " Flora Boreali Americana " of Michaux.

Stephen Elliott, who, like Muhlenberg was self-trained in botany, was the author of the remarkable flora of South Carolina and Georgia, which he very modestly called a " sketch."[41] Here is a large descriptive work where very much of the matter was based on the author's personal observations. From 1808 to Muhlenberg's death in 1815, the two botanists, one in Pennsylvania, the other in South Carolina, were in close correspondence, and Elliott was greatly indebted to Muhlenberg for assistance and advice. This he acknowledged in the dedication of his work which appears following the title page of volume one, 1821:

---

[41] **Elliott, S.** A Sketch of the Botany of South Carolina and Georgia. **1**: 1-606. *pl. 1-6.* [1816]-21; **2**: i-viii. 1-743. *pl. 7-12.* [1821]-24. Charleston, J. R. Schenck.

> " From a remembrance of his extensive and profound knowledge of the science of Botany, and of his unwearied efforts to improve the Flora of North America; from a high respect for his many virtues, his liberal temper and exemplary character; and for the personal advantages derived from years of uninterrupted correspondence, this volume is inscribed to the memory of the late Rev. Henry Muhlenberg of Lancaster, Pennsylvania."

It was undoubtedly the pioneer work of Muhlenberg from 1780 to 1815 which to a large degree paved the way for the remarkably strong development of botanical work in Philadelphia in the early decades of the past century. At this time Philadelphia was the one outstanding center of botanical research in the country, as witnessed by the descriptive works of the two Bartons, Darlington, Nuttall, Von Schweinitz, Baldwin, and others; and from this center, through the influence of Muhlenberg, descriptive botanical work was extended to other places such as Boston, New York, and Charleston. Other contributing factors were the interests of the somewhat earlier workers such as Marshall, and the two Bartrams, as well as the influence of Pursh while a resident of Philadelphia; the presence of reasonably ample botanical library facilities, which were then largely wanting in other American centers; the large accumulations of botanical material, first as private, later as institutional collections; and the early development of organizations and institutions such as the American Philosophical Society and the Academy of Natural Sciences of Philadelphia. For details see the work of Harshberger.[42]

CONCLUSION

We have tried to locate the new unlisted Muhlenberg names to the best of our ability but we do not claim that we have succeeded in finding all of them. We have also attempted to indicate reductions as far as this is possible, although neither of us are in any sense specialists on the flora of North America. The very fact that Muhlenberg in general did not cite authorities for his accepted binomials has naturally complicated the task. For any errors and omissions and for any erroneous reductions that may appear in this document we accept full responsibility. We have merely tried to do the best that we could in what has proved to be not a simple nor an easy task. We admit that in most cases what we have located merely adds to synonymy, but in a few cases changes in accepted specific names for valid species are indicated, such as *Ulmus rubra* Muhl. (1793) to replace *Ulmus fulva* Michx. (1803), as Fernald has already demonstrated.

In this paper we have concerned ourselves only with those new Muhlenberg names which are either not listed in standard indices (these marked with an asterisk, *), or those which are erroneously entered (these marked with a dagger, †). It will be noted that the majority of the latter are those where the " Index Kewensis " entry is to the second edition of Muhlenberg's " Catalogus " (1818), rather than to the first edition (1813), in which they originally appeared; such corrections are of minor importance. The total of unlisted binomials is about 235 and of erroneously recorded ones about 190. There are few nomenclatural upsets, but there are naturally a number of additions to an already overburdened synonymy. While we have listed the strictly *nomina nuda*, we actually question the value of so doing as such names have no standing whatsoever and in no way affect nomenclature.

---

[42] **Harshberger, J. W.** The Botanists of Philadelphia and Their Work. i-xii. 1-457. illus. 1899. Philadelphia.

This is the fifth paper in a series on overlooked or erroneously recorded technical names of plants appearing in early North American works on botany, the first having been the senior author's consideration of the Bartram names[43] of 1791 and the second the Merrill and Reeder paper[44] on those appearing in the eight editions of Eaton's " Manual " (1817-1840). Two lesser ones are based on the works of Wood[45] and Chapman.[46] The most extensive paper in the series, an " Index Rafinesquianus " is in press and will be issued in 1949. The grand totals are impressive and rather clearly indicate that some American botanists who have concerned themselves with the bibliographic aspects of the actual publication of technical names for plants in early American botanical literature have not taken the time to make the necessary critical examination of these publications. Thus it is that in the works of Bartram, Muhlenberg, Eaton, Wood, Chapman, and Rafinesque, all published between 1791 and 1897, we note approximately 750 validly published but unlisted new generic names, 330 new subgeneric or sectional names, 3200 specific names, and in the works of Rafinesque alone 900 new varietal names (those in the works of the other authors were not considered). We believe that all who follow the cult of naming and describing new genera, subgenera, and sections, species, and even varieties, should first seriously consider what their predecessors have proposed, taking the time necessary to examine the early literature. Until names are at least listed in standard indices they are very largely " lost," but merely because of clerical (and botanical) oversights in detecting and listing such names this is no reason why they should not be considered on their merits. We note that there are still unlisted new names in early standard descriptive works published by Michaux, Pursh,

---

[43] **Merrill, E. D.** In Defense of the Validity of William Bartram's Binomials. Bartonia **23**: 10-35. 1945.

[44] **Merrill, E. D. & Reeder, J. R.** New Plant Names published by Amos Eaton Between the Years 1817 and 1840. Bartonia **24**: 26-79. 1947.

[45] **Merrill, E. D.** Unlisted New Names in Alphonso Wood's Botanical Publications. Rhodora **50**: 101-130. 1948.

[46] **Merrill, E. D.** Unlisted Binomials in Chapman's Flora of the Southern United States. Castanea **13**: 61-70. 1948.

Nuttall, Elliott, Torrey, and Gray,[47] and if one be on the alert in one's bibliographic researches it is surprising how large a number of unlisted names may be detected in a relatively short time. In the words of Dr. L. H. Bailey inventories are needed, for without inventories there is no valid discussion of objects; and certainly this general subject of listing overlooked but validly published names of plants helps on the needed inventory. We depend on the remarkable and indispensable "Index Kewensis" and its ten supplements (1893-1947) for the names and their original places of publication of the hundreds of thousands of species. We believe that it is the duty of all productive workers to assist in making that work more complete through entries which may be made in future supplements of previously overlooked binomials. We realize, however, that the conservatives, some of whom scarcely devote sufficient time to a consideration of bibliographic problems associated with published technical names, will sympathize with James Britten's statement[48] regarding Dr. Pennell's discovery in **1921** of **84** unlisted generic names validly published by Rafinesque in **1840**: "We do not think botanists generally will congratulate Mr. Pennell or themselves on the discovery." Neither are we impressed with the wishful thinking of those who would lightly dismiss early published but as yet unlisted names on the basis that they occur in "outdated" literature.[49] We might devoutly wish that we could legitimately dismiss a vast amount of early published work of numerous authors from consideration perhaps on the egotistical basis that we could, *de novo*, do a much better piece of work. However, in the literature of systematic botany there is no such category as "outdated," as long as the individual authors concerned conformed to certain standard tenets in the presentation of their published data.

The completion of this study was made possible through the utilization of the small balance in a grant made from the Penrose Fund of the American Philosophical Society which was provided to further the work on the Bartram and Muhlenberg problems, and a special grant from the Bache Fund of the National Academy of Sciences. The receipt of this financial support is gratefully acknowledged.

---

[47] We have not concerned ourselves with the fugitive unlisted names in the works of the authors mentioned except occasionally as Muhlenberg recorded them. We did however check the three editions of Bigelow's "Florula Bostoniensis," ed. 1 (1814), ed. 2 (1824), and ed. 3 (1840), with the following results: *Bunias †edentula* Bigel. Fl. Bost. 157. 1814 (the Ind. Kew. entry is ed. 3, 267 [1840] ; *Rumex †pallidus* Bigel. op. cit., ed. 2, 143. 1824 (the Ind. Kew. entry is ed. 3, 153 [1840]) ; *Lathyrus †maritimus* Bigel. op. cit. ed. 2, 268. 1824 (the Ind. Kew. entry is ed. 3, 286 [1840] ; *Orchis †grandiflora* Bigel. op. cit. ed. 2, 321. 1824 (the Ind. Kew. entry is ed. 3, 343 [1840]) ; *Neottia †gracilis* Bigel. op. cit. ed. 2, 322. 1824 (the Ind. Kew. entry is ed. 3, 345 [1840]) ; *Salicornia †mucronata* Bigel. op. cit. ed. 2, 2. 1824 (the Ind. Kew. entry is ed. 3, 2 [1840]) ; *Cyperus †castaneus* Bigel. ed. 2, 18. 1824 (the Ind. Kew. entry is ed. 3, 19 [1840]) ; *Festuca †acutifolia* Bigel. ed. 2, 37. 1824 (the Ind. Kew. entry is ed. 3, 39 [1840]) ; *Urasperum †hirsutum* Bigel. op. cit., ed. 2, 112. 1824 (the Ind. Kew. entry is ed. 3, 120 [1840]) ; and *Erythronium †bracteatum* Bigel. ed. 2, 136. 1824 (the Ind. Kew. entry is Bigel. in Beck. Bot. 365 [1833]). There are very few nomenclatural changes in edition three, *Xanthoxylum fraxineum* Willd. being a correction for the erroneous *X. traxineum* of edition two, and a description being provided for *Utricularia resupinata* Greene ex Bigel. op. cit. ed. 3, 10. 1840, validating Greene's *nomen nudum* of 1835. There are apparently no unlisted new binomials in any of the editions of Bigelow's work, but there are ten of his new names that are credited to the third edition (1840) when actually they appear for the first time in edition two (1824) or in one case in edition one (1814).

[48] Jour. Bot. **59**: 184. 1921.

[49] **Ames, O.** Botanical Museum Leaflets, Harvard University **12**: 17. 1947.

As already stated, in the following enumeration the asterisk (*) preceding a specific name indicates that the binomial is not listed in "Index Kewensis," while the dagger (†) denotes a correction to the entry in that indispensable work.

PTERIDOPHYTA

Schizaea †tortuosa Pursh ex Muhl., Cat. 98. 1813; ed. 2, 102. 1818, *nom. nud.* = *S. pusilla* Pursh (1814).

This case was briefly discussed by Merrill and Reeder in Bartonia **24**: 50. 1947. The entry in Christensen's Index Filicum is confused as between the first and second editions of Muhlenberg's Catalogus. This is a case where Muhlenberg apparently had a named specimen from Pursh, but the latter, in publishing the first description of the species, selected a different specific name; see p. 27.

SPERMATOPHYTA

Acacia *divaricata Muhl., Cat. 96. 1813; ed. 2, 100. 1818, *nom. nud.*

This was, by error, credited to Donn, but the latter did not recognize the genus *Acacia*, and published it as *Mimosa *divaricata* Donn, Hort. Cantab. ed. 4, 222. 1807, *nom. nud.* from Carolina. *Acacia divaricata* Muhl. has nothing to with *A. divaricata* Willd. (1806).

Acacia *miamensis Muhl., ll. cc., *nom. nud.* "Miami."

This is also erroneously credited to Don[n]. Unquestionably its basis was *Mimosa *miamensis* Donn, Hort. Cantab. ed. 4, 223. 1807, *nom. nud.* from North America. In edition eight of Donn's work, 325. 1815, Pursh gives the locality as Carolina, indicating the date of introduction of the species into England as 1806. *Mimosa miamensis* Roxb., Hort. Bengal. 41. 1814, *nom. nud.*, undoubtedly represents the same species, merely indicated as from America; apparently Roxburgh received seeds, directly or indirectly, from the Cambridge botanic garden. The three *nomina nuda* here discussed probably all belong with *Desmanthus illinoensis* (Michx.) MacMill. The original locality was doubtless the Miami River region, Ohio.

Agrimonia *minor Muhl. in Trans. Am. Philos. Soc. **3**: 170. 1793, *nom. nud.* Pennsylvania (Lancaster) = *A. microcarpa* Wallr. (1842).

This was indicated by Muhlenberg as a new species. There is an earlier *Agrimonia minor* Mill.

Agrimonia †pumila Muhl., Cat. 47. 1813; ed. 2, 48. 1818, *nom. nud.*; Muhl. ex Raf., Fl. Ludovic. 134. 1817, *nom. nud.* Mississipi = *A. rostellata* Wallr. (1842), fide Small.

Agrostis †clandestina Muhl. in Trans. Am. Philos. Soc. **4**: 236. 1799, *nom. nud.*; Descr. Gram. 73. 1817, *descr.*; Biehler, Pl. Nov. Herb. Spreng. Cent. 4. 1807, *descr.*; Spreng., Fl. Hal. Mant. 32. 1807, *descr.* Pennsylvania (Lancaster) = *Sporobolus clandestinus* (Biehler) Hitchc; see Hitchcock in Bartonia **14**: 33. 1832.

The proper authority for the binomial *Agrostis clandestina* is Biehler who first published a description; Muhlenberg originated the name. Muhlenberg in 1817 cited Sprengel's description.

Agrostis *cylindrica Muhl., op. cit., **3**: 160. 1793, *nom. nud.* Pennsylvania (Lancaster).

Agrostis *decumbens Muhl., Cat. 10. 1813; ed. 2, 10. 1818, *nom. nud.*; Descr. Gram. 68. 1817, *descr.*; Muhl. ex Barton, Fl. Phila. Prodr. 21. 1815, *descr.*; Muhl. ex Ell., Sketch **1**: 136. 1816, *descr.* = *A. palustris* Huds. et *A. verticillata* Vill.

Muhlenberg queries the correctness of the identification in his "Catalogus", clearly indicating that he thought he was recording a species named by some other author. In 1817 he cited the authority as Gaudin [Agrost. Helv. **1**: 78. 1811] = *A. alba* Linn. var. *decumbens* Gaudin. The form described in Elliott's Sketch is *A. verticillata* Vill.; see Hitchcock in Bartonia **14**: 32. 1932.

Agrostis †diffusa Muhl. in Trans. Am. Philos. Soc. **3**: 160. 1793, *nom. nud.*; Cat. 10. 1813, ed. 2, 9. 1818, *nom. nud.*; Descr. Gram. 64. 1817, *descr.* Pennsylvania = *Muhlenbergia mexicana* (Linn.) Trin.; see Hitchcock in Bartonia **14**: 31. 1932.

Agrostis †glauca Muhl., Cat. 10. 1813; ed. 2, 10. 1818, *nom.* (*Arundo glauca* Muhl.); Descr. Gram. 76. 1817, *descr.* New England, Pennsylvania, Carolina = *Calamagrostis cinnoides* (Muhl.) Barton; see Hitchcock in Bartonia **14**: 33. 1932.

Agrostis †involuta Muhl., Cat. 11. cc. *nom. nud.*; Descr. Gram. 72. 1817, *descr.* New York, Pennsylvania = *Sporobolus asper* (Michx.) Kunth; see Hitchcock in Bartonia **14**: 33. 1932.

Agrostis †laxa Muhl. in Trans. Am. Philos. Soc. **4**: 236. 1799, *nom. nud.*; Schreb. ex Pursh, Fl. Am. Sept. **1**: 61. 1814, *nom.* in syn. Pennsylvania (Lancaster) = *A. hiemalis* (Walt.) Britton, Sterns, & Poggenb.

This was undoubtedly a Schreber name transmitted to Muhlenberg in a list of identifications; we suspect that Muhlenberg gave Pursh a duplicate specimen. Muhlenberg, Descr. Gram. 60. 1817 cites it as a synonym of *Trichodium laxiflorum* Muhl.

Agrostis †pungens Muhl., Cat. 11. cc., *nom. nud.*; Descr. Gram. 72. 1817, *descr.*; sensu Pursh, Fl. Am. Sept. **1**: 64 1814, *descr.*, non Schreb. Carolina = *Sporobolus virginicus* (Linn.) Kunth.

Muhlenberg's specimen is *Sporobolus virginicus* (Linn.) Kunth; he probably thought that he had a specimen representing *Agrostis pungens* Schreb., a Mediterranean species = *Sporobolus pungens* (Schreb.) Kunth, and did not propose the name as a new one; see Hitchcock in Bartonia **14**: 33. 1932.

Agrostis †sericea Muhl., Cat. 10. 1813; ed. 2, 9. 1818, *nom. nud.*; Descr. Gram. 64. 1817, *descr.*; Muhl. ex Ell., Sketch **1**: 135. 1816, *descr.* New England to Georgia = *Muhlenbergia capillaris* (Linn.) Trin.

Stipa sericea Michx., cited by Elliott as a synonym = *Muhlenbergia capillaris* (Lam.) Trin. var. *filipes* (M. A. Curtis) Chapm.; see Hitchcock in Bartonia **14**: 31. 1932.

Agrostis †setosa Muhl., Cat. 10. 1813; ed. 2, 10. 1818, *nom. nud.*; Descr. Gram. 68. 1817, *descr.* Pennsylvania = *Muhlenbergia racemosa* (Michx.) Britton, Sterns, & Poggenb.; see Hitchcock in Bartonia **14**: 33. 1932.

Agrostis †sobolifera Muhl. in Trans. Am. Philos. Soc. **4**: 236. 1799, *nom. nud.*; Muhl. ex Willd., Enum. Hort. Berol. 95. 1809, *descr.*; Muhl., Descr. Gram. 70. 1817, *descr.* Pennsylvania (Lancaster) = *Muhlenbergia sobolifera* (Muhl.) Trin.; see Hitchcock in Bartonia **14**: 32. 1932.

Aira †mollis Muhl., Cat. 11. 1813; ed. 2, 10. 1818, *nom. nud.*; Descr. Gram. 82. 1817, *descr.*; Muhl. ex Ell., Sketch **1**: 153. 1816, *descr.* Pennsylvania, Carolina = *Sphenopholis nitida* (Spreng.) Scribn.; see Hitchcock in Bartonia **14**: 34. 1932.

Aira *navicularis Schreb. ex Muhl. in Trans. Am. Philos. Soc. **3**: 161. 1793, *nom. nud.* Pennsylvania (Lancaster).

Aira †pallens Muhl., l. c., *nom. nud.*; Cat. 11. cc., *nom. nud.*; Biehler, Pl. Nov. Herb. Spreng. Cent. 8. 1807, *descr.*; Spreng., Fl. Hal. Mant. 33. 1807, *descr.*; Muhl., Descr. Gram. 84. 1817, *descr.*; Muhl. ex Ell., Sketch **1**: 151. 1816, *descr.*, as *Aira* "pallens, Var.

aristata Muhl. Cat." (*Aira pennsylvanica* Spreng.). Pennsylvania = *Sphenopholis nitida* (Spreng.) Scribn.

The specimen Muhlenberg described is probably *Sphenopholis aristata* (Scribn. & Merr.) Heller; see Hitchcock in Bartonia **14**: 34, 35. 1932.

Aira *speciosa Muhl. in Trans. Am. Philos. Soc. **3**: 161. 1793, *nom. nud.* Pennsylvania (Lancaster).

This was indicated as a new species.

Aira †truncata Muhl., l. c., *nom. nud.*; Cat. 11. cc., *nom.*; Descr. Gram. 83, 1817, *descr.* (*A. obtusata* Michx.). Pennsylvania (Lancaster) = *Sphenopholis obtusata* (Michx.) Scribn.; see Hitchcock in Bartonia **14**: 34. 1932.

Allionia *alba Muhl., Cat. 15. 1813; ed. 2, 14. 1818, *nom. nud.* Carolina.

Probably this was due to an error in transcription, *Allionia albida* Walt. (1788) being intended.

Allium †bifolium Muhl., Cat. 34. 1813; ed. 2, 34. 1818, *nom. nud.* Western America, cult. Pennsylvania.

This was based on specimens grown from Lewis and Clark expedition seeds. In Muhlenberg's unpublished manuscript of 1807 this is indicated as "Onion of the Missouri within the Rocky Mountains."

Allium *montanum Muhl. in Trans. Am. Philos. Soc. **3**: 167. 1793, *nom. nud.* Pennsylvania (Lancaster).

This was indicated as a new species.

Amorpha *emarginata Muhl., Cat. 64. 1813; ed. 2, 66. 1818, *nom. nud.* New Jersey, Carolina.

Ampelopsis †hirsuta Donn, Hort. Cantab. ed. 4, 50. 1807, *nom. nud.*; Muhl., Cat. 27. 1813; ed. 2, 26. 1818, *nom. nud.* North America = *A. quinquefolia* Michx., fide L. H. Bailey.

The Index Kewensis entry is, by error, "Donn, Hort. Cantab. 166." p. 66, ed. 7, 1812 intended.

Amsonia †salicifolia Muhl., Cat. 27. 1813; ed. 2, 27. 1818, *nom. nud.*; Pursh, Fl. Am. Sept. **1**: 184. 1814, *Descr.* Pennsylvania, Carolina, Georgia.

Pursh may have here accepted Muhlenberg's name and published it as his own; his specimens were from Carolina and Georgia; see p. 27.

Anchusa *hirta Muhl., Cat. 18. 1813; ed. 2, 19. 1818, *nom.* (*Batschia* [*gmelini* Michx.]); Ell., Sketch **1**: 227. 1817, *nom.* in syn.; Michx. ex DC., Prodr. **10**: 53. 1846, *nom.* (*Lithospermum hirtum* Lehm.). Pennsylvania, Carolina, Georgia = *Batschia carolinensis* (Walt.) G. F. Gmel.

Andromeda *floribunda Muhl., Cat. 43. 1813; ed. 2, 44. 1818, *nom. nud.*; Pursh, Fl. Am. Sept. **1**: 293. 1814, *descr.* Carolina = *Pieris floribunda* (Pursh) Benth.

This was apparently a name originated by Muhlenberg and accepted by Pursh as his own; see p. 27.

Andromeda *frondosa Muhl., Cat. 11. cc., *nom. nud.*; Pursh, Fl. Am. Sept. **1**: 295. 1814, *descr.*; Muhl. ex Ell., Sketch **1**: 490. 1817, *descr.* Carolina, Georgia (Virginia, fide Pursh) = *Lyonia frondosa* (Pursh) Nutt. (*Arsenococcus frondosus* Small.)

This was perhaps another case where Pursh appropriated a Muhlenberg name; see p. 27.

Andromedia †ligustrina Muhl., Cat. 11. cc., *nom.* (*Vaccinium ligustrinum* Linn.); Muhl. ex Ell., Sketch **1**: 490. 1817, *descr.* Pennsylvania = *Lyonia ligustrina* (Linn.) DC. (*Arsenococcus ligustrinus* Small).

Andromeda *serratifolia Donn, Hort. Cantab. ed. 4, 98. 1807, *nom. nud.*: Muhl., Cat. 11. cc., *nom. nud.*; "Hort." ex DC., Prodr. **7**: 602. 1838, *nom.* in syn. Carolina = *Leucothoe catesbaei* (Walt.) A. Gray.

De Candolle's *Andromeda serratifolia* "Hort." probably represents the species that Donn named in 1807.

Andropogon *digitatus Muhl. in Trans. Am. Philos. Soc. **3**: 181. 1793, *nom. nud.* Pennsylvania (Lancaster).

This was clearly indicated as a new species.

Andropogon *latifolius Muhl., Cat. 94. 1813; ed. 2, 99. 1818, *nom.* (*A. ambiguus* Michx.). New Jersey, Carolina, Georgia = *Gymnopogon ambiguus* (Michx.) Britton, Sterns, & Poggenb.

Andropogon †purpurascens Muhl. in Trans. Am. Philos. Soc. **4**: 237. 1799, *nom.* ("Clayton 602"); Muhl. ex Willd., Sp. Pl. **4**: 913. 1806, *descr.* Pennsylvania, Virginia, Carolina = *Andropogon scoparius* Michx. (1803).

Clayton 602 is the only actual specimen that Gronovius cited under his *Andropogon spicis conjugatis, calycibus hirsutis,* Fl. Virg. ed. 2, 159. 1762 (this was the edition that was available to Muhlenberg), and this was a Virginia specimen. We suspect that were a Linnaean binomial involved *Clayton 602* would be interpreted as the type in spite of the fact that the three other references added, Royen, Tournefort, and Plukenet represent species of *Andropogon, sensu latiore,* totally different from "Lugurus spicis purpurascentibus. *Clayt. n. 602.*" One may regret that Muhlenberg's beautifully descriptive specific name was not, perhaps, properly validated in 1799, for in late summer and autumn the species does give a pale purple cast to large areas where it is a dominant plant; yet one may be satisfied that the long used *Andropogon scoparius* Michx. can scarcely be replaced by the earlier Muhlenberg name. *Clayton 602* is *A. scoparius* Michx. Assuming that the mere citation of *Clayton 602* following *A. purpurascens* Muhl. does not constitute valid publication of that name how close a decision may be is illustrated by *Scutellaria elliptica* Muhl. in Trans. Am. Philos. Soc. **3**: 173. 1793, *nom. nud.* but indicated as "N. S." with the addition of "Claytoni 92." Fernald, in Rhodora **47**: 201. 1945, insists that this citation of page 92 of Gronovius' Flora Virginica ed. 2, 1762, constitutes valid publication of *S. elliptica* Muhl. as of 1793, and we accept his conclusion in this case.

Andropogon *tener Schreb. ex Muhl., op. cit. **3**: 182. 1793, *nom. nud.* Pennsylvania (Lancaster).

This can scarcely be the same as *Andropogon tener* (Nees) Kunth, as Lancaster is far out of range for the latter which is unknown north of Georgia.

Angelica †hirsuta Muhl., Cat. 31. 1813; ed. 2, 30. 1818, *nom.* (*A. triquinata* Michx.). New York, Pennsylvania = *A. triquinata* Michx.

Annona *parviflora Muhl., Cat. 53. 1813; ed. 2, 55. 1818, *nom. nud.* Carolina, Georgia.

Arabis †bulbosa Schreb. ex Muhl. in Trans. Am. Philos. Soc. **3**: 174. 1793, *nom.* ("Clayton 99, n. 45," i. e. *Arabis foliis ovatis denticulatis glabris* Gronov., Fl. Virgin. ed. 2, 99. 1762); Cat. 61. 1813; ed. 2, 23, 1818, *nom. nud.*; Biehler, Pl. Nov. Herb. Spreng. Cent. 27. 1807, *descr.*; Spreng., Fl. Hal. Mant. 46. 1807, *descr.* Pennsylvania = *Cardamine bulbosa* (Schreb.) Britton, Sterns, & Poggenb. (*C. rhomboidea* DC.).

Pursh, Fl. Am. Sept. **2**: 437, 1814, cites as a synonym of *Arabis rhomboidea* Pers. (1807) "A. bulbosa Muhlb. *in litt.*" Biehler and Sprengel[50] in describing the species in

---

[50] See Fernald, in Rhodora **47**: 197-202. 1945 for a discussion of this Biehler-Sprengel case. Biehler's thesis, Plantarum novarum ex herbarii Sprengelii centuriam . . . 1-46. 1807, was published first. As Fernald expresses it: "Biehler having done a piece of descriptive work considered by Sprengel sufficient for his thesis, Sprengel promptly absorbed it and as the second part of his own Mantissa Prima (pp. 27-58) put it out

1807 cited no authority for it, merely stating " E Pennsylvania Mühlenb." If the original appearance of the name in 1793 constitutes valid publication, and we assume that it does because in this case Muhlenberg cited the page of the second edition of Gronovius (the only edition that was available to him), then the use of Schreber's name in parenthetic citation is correct.

Arabis *claytoni Muhl., l. c., *nom.* (" integrifolia Clayton 99, n. 745 ", i. e., *Arabis foliis integris* Gronov., Fl. Virgin. ed. 2, 99. 1762); Cat. ll. cc., *nom. nud.* Virginia, Tennessee = *Arabidopsis *thaliana* (Linn.) Heynh. in Holl & Heynh., Fl. Sachsen **1**: 538. 1842 (*Sisymbrium thalianum* J. Gay).

In this case Heynhold (1842) replaces Schur (1866) as the authority for both the generic name *Arabidopsis* (DC.) and for the binomial *A. thaliana.* Schur in 1866 and Britton in 1913 independently made the same transfer. This reduction of the Gronovian species is based on a note made by A. Gray, when he examined the Clayton specimen. Professor Fernald informs us that the species is now a superabundant weed in Virginia.

Arenaria †pensylvanica Muhl. in Trans. Am. Philos. Soc. **3**: 169, 1793, *nom. nud.* (Ind. Kew. "pensylvanica Muhl. Ind. Fl. Lanc. 169"). Pennsylvania (Lancaster) = *A. lateriflora* Linn., fide A. Gray.

Arenaria *setacea Muhl., l. c., *nom. nud.* Pennsylvania (Lancaster) = ? *A. stricta* Michx. (1803), fide A. Gray.

Arenaria *uniflora Muhl., Cat. 45. 1813; ed. 2, 46. 1818, *nom.* (*Stellaria* [*uniflora* Walt.]). Carolina, Georgia = *Stellaria uniflora* Walt. (*Sabulina uniflora* Small).

Arethusa *stellata Muhl., Cat. 81, 1813; ed. 2, 84. 1818, *nom. nud.* Pennsylvania = ? *A. bulbosa* Linn.

Argemone *alba Muhl., Cat. 51, 1813; ed. 2, 53, 1818, *nom. nud.* Virginia, Carolina. Prob. = *Argemone mexicana* Linn. var. *ochroleuca* Lindl.

Aristida †lanosa Muhl., Cat. 14, 1813; ed. 2, 13. 1818, *nom. nud.*; Descr. Gram. 174. 1817, *descr.*; Muhl. ex Ell., Sketch **1**: 143. 1816, *descr.* Carolina.

A valid species. Synonyms are *Aristida lanata* Poir., 1810, non Forsk, 1775; and *A. lanuginosa* Bosc, 1836, 1842; see Hitchcock in Bartonia **14**: 47. 1932.

Aristolochia †hirsuta Muhl., Cat. 81, 1813; ed. 2, 85. 1818, *nom. nud.* (haud " Descr. Uber. 18 " ut in Ind. Kew.); Ell., Sketch **2**: 511. 1823, *nom.* in syn. Cherokee (Northern Georgia) = *A. tomentosa* Sims (1811).

Aristolochia †sagittata Muhl., ll. cc., *nom. nud.*; Duchartre in DC., Prodr. **15**(1): 134. 1864, *nom.* in syn. Carolina Cherok[ee] (Northern Georgia) = *A. hastata* Nutt. (1818).

Arundinaria †gigantea (Walt.) Muhl., Cat. 14. 1813; ed. 2, 13. 1818, *nom.* [*Arundo gigantea* Walt.]; Chapm., Fl. South. U. S. 561. 1860. Carolina, Mississippi.

Arundinaria †tecta (Walt.) Muhl., ll. cc., *nom.* [*Arundo tecta* Walt.]; Descr. Gram. 191. 1817, *descr.* Carolina, Mississippi.

In neither edition of the Catalogus did Muhlenberg cite the name-bringing synonyms, *Arundo gigantea* Walt. and *A. tecta* Walt., the entries being "Arundinaria. Mx. Ludolphia, Willd.," followed by the two species "tecta Walt. gigantea Walt.". He did, however, add the synonym *Arundo tecta* Walt. when he published a description in 1817. This is a case very similar to the *Bartonia* one discussed on p. 25.

---

under his own name as *Novarum Plantarum ex Herbario meo Centuria.*" Muhlenberg may have sent a duplicate named specimen to Sprengel without indicating the author of the name, so botanical piracy cannot definitely be charged here, although Schreber was the original author of *Arabis bulbosa*; but the absorption of Biehler's published paper by Sprengel, without rendering credit to him impresses us as definitely piratical.

Arundo †cinnoides Muhl., Cat. 13. 1813; ed. 2, 13. 1818, *nom. nud.*; Descr. Gram. 187. 1817, *descr.*; Muhl. ex Barton, Fl. Phila. Prodr. 23. 1815, *descr.* = *Calamagrostis cinnoides* (Muhl.) Barton; see Hitchcock in Bartonia **14**: 49. 1932.

Arundo *glauca Muhl., Cat. 11. cc., *nom. alt. Agrostis glauca* Muhl. = *Calamagrostis cinnoides* (Muhl.) Barton.

Asarum *acuminatum Muhl., Cat. ed. 2, 47. 1818, *nom. nud.* No locality given.

We suspect that this may be the same as *Asarum acuminatum* Bickn. (*A. canadense* Linn. var. *acuminatum* Ashe) or *A. reflexum* Bickn. (*A. canadense* Linn. var. *reflexum* B. L. Rob.).

Asclepias *acuminata Muhl., Cat. 28. 1813; ed. 2, 27. 1818, *nom. alt. A. exaltata* Muhl.; Barton, Fl. Phila. Prodr. 35. 1815, *nom.* in syn. = seq.

Asclepias †exaltata Muhl., Cat. ed. 1, 28. 1813; ed. 2, 27. 1818, *nom. nud.*; Ell., Sketch **1**: 319. 1817, *nom.* in syn. = *A. exaltata* Linn., Amoen. Acad. **3**: 404. 1756, *descr.* (*A. syriaca* Linn. var. *exaltata* Linn., Sp. Pl. ed. 2, 313. 1762) (*A. phytolaccoides* Pursh, Fl. Am. Sept. **1**: 180. 1814).

Elliott credits the binomial to Lyon. Pursh apparently adopted the name as his own but does say: "The plant was introduced into England and in 1812, by Mr. Lyon, under the above name." Britton & Brown, Ill. Fl. U. S. **3**: 9. 1898, followed by Small, erroneously accepted the name as *Asclepias exaltata* (Linn.) Muhl., overlooking the fact that *A. exaltata* Linn. was published in 1756 with an ample description, and further that even if Muhlenberg intended his name as a new one, he cited no synonyms. In Muhlenberg's unpublished description of *Asclepias* "exaltata (acuminata)" (Lancaster Flora MS p. 153) he states, *inter alia* " vel etiam Syriaca non in Herbario L. nomen bonum phytolacc... vel acuminata."

Asclepias †nutans Muhl., Cat. 11. cc., *nom. nud.*; Steud., Nomencl. ed. 2, **1**: 146. 1840, *nom.* (*Acerates viridiflora* Ell.). Pennsylvania; Georgia = *Asclepias viridiflora* Raf. (1808).

Pursh redescribed *Asclepias viridiflora* as his own species, Fl. Am. Sept. **1**: 181. 1814, accidentally or otherwise overlooking Rafinesque's earlier use of the same name for the same species. The first reduction of Muhlenberg's species that we have noted is by Torrey, Fl. U. S. **1**: 284. 1824, as *A. viridiflora* Raf. The Index Kewensis entry is "Muhl. ex Steud. Nomencl. ed. II. i. 146."

Aster *albus Donn, Hort. Cantab. ed. 3, 156. 1804, *nom. nud.*; Muhl., Cat. 75. 1813; ed. 2, 78. 1818, *nom. nud.* North America.

Aster *flexuosus Donn, op. cit. ed. 2, 109. 1800, *nom. nud.*; Muhl., Cat. 11. cc., *nom. nud.* North America.

This may or may not be the same as *Aster flexuosus* Nutt. (1819) = *A. tenuifolius* Linn.

Aster *ledifolius Muhl., Cat. 75. 1813; ed. 2, 77. 1818, *nom. alt. A. nemoralis* Ait; Pursh, Fl. Am. Sept. **2**: 544. 1814, *descr.* New Jersey = *A. nemoralis* Ait. (1789).

Pursh may here have adopted Muhlenberg's specific name as his own; see p. 27.

Aster †liatroides Muhl. ex Ell., Sketch **2**: 354. 1823, *nom.* in syn.; DC., Prodr. **5**: 230. 1836, *nom.* in syn. = *A. surculosus* Michx. (1803).

Aster *purpureus Donn, Hort Cantab. ed. 4, 189. 1807, *nom. nud.*; Muhl. Cat. 75. 1813; ed. 2, 78. 1818, *nom. nud.* North America.

Aster *secundus Muhl. ex Barton, Fl. Phila. Prodr. 80. 1815, *nom.* ut syn. *A. ericoides* Linn. Pennsylvania.

Aster *sphacelatus Willd. ex Muhl., Cat. 75. 1813; ed. 2, 78. 1818, *nom. nud.* New Jersey, Carolina.

Atragene *pennsylvanica Muhl., Cat. 54. 1813; ed. 2, 55. 1818, *nom. nud.* Pennsylvania = *A. americana* Sims, fide Torr., Cat. Pl. N. Y. 51. 1819 = *Clematis verticillaris* DC.

Probably the source of this specific name was *Clematis pensylvanica* Donn, Hort. Cantab. ed. 4, 129. 1807, also a *nomen nudum.*

Avena †setacea Schreb. ex Muhl. in Trans. Am. Philos. Soc. **3**: 161. 1793, *nom. nud.*; Muhl. ex Trin. in Mém. Acad. Pétersb. VI. Math. Phys. Nat. **1**: 87. 1830. Pennsylvania (Lancaster) = *Aristida dichotoma* Michx. (1803).

Bartonia *paniculata (Michx.) Muhl., Cat. 16. 1813; ed. 2, 15. 1818, *nom.* (*Centaurella* [*paniculata* Michx.]). Pennsylvania, Carolina, Georgia.

See the discussion of this case, p. 25.

Boltonia *affinis Muhl., Cat. 77. 1813; ed. 2, 80. 1818, *nom. nud.* Missouri.

Brassica †washitana Muhl., Cat. 61. 1813; ed. 2, 63. 1818, *nom. nud.* Washita [Arkansas or Oklahoma] = ? *Streptanthus maculatus* Nutt. (1818) (*Stanleya ? washitana* DC., Syst. **2**: 512. 1821, *nom.*).

Nuttall, Gen. **2**: 72. 1818, suggested that this might prove to be a second species of his genus *Stanleya,* but stated that there was no specimen in the Muhlenberg herbarium.

Bumelia *decandra Muhl., Cat. 24, 1813; ed. 2, 24. 1818, *nom. nud.* No locality indicated.

Bumelia *laevis Donn ex Muhl., Cat. 11. cc., *nom. nud.*; Pursh ex Donn, Hort. Cantab. ed. 8, 65. 1815, *nom. nud.* Carolina, fide Pursh.

We cannot explain Muhlenberg's use of this "Donn" name in 1813. The first place that we found it is in edition eight of Donn's work (1815) which was prepared by Frederick Pursh, a volume that of course Muhlenberg never saw.

Caladium *speciosum Ell. ex Muhl., Cat. ed. 2, 93. 1818, *nom. nud.* No locality given.

The basis of this name was doubtless a specimen sent by Elliott to Muhlenberg, either from South Carolina or Georgia. It is possibly the form actually described by Elliott as *C. *glaucum* Ell., Sketch **2**: 631. 1824 = *Peltandra *glauca* (Ell.) Feay ex Wood, Class-Book 669. 1861.

Callitriche †terrestris Muhl. Cat. 1. 1813; ed. 2, 1. 1818, *nom. nud.* Pennsylvania. = *C. terrestris* Raf. in Med. Repos. II. **5**: 358. 1808; op. cit. III. **2**: 408. 1811, ut *C. terrestris* Muhl.; Am. Monthly Mag. Crit. Rev. **1**: 359. 1817, ut *C. terrestris* Raf. & Mg.[Muhl.]

This was undoubtedly an original Muhlenberg binomial which Rafinesque appropriated; see p. 26.

Caltha †dentata Muhl., Cat. 55. 1813; ed. 2, 56. 1818, *nom. nud.* Pennsylvania = *Caltha palustris* Linn. var. *flabellifolia* (Pursh) Torr. & Gray.

Campanula *aculeata Muhl. in Trans. Am. Philos. Soc. **3**: 164. 1793, *nom. nud.* Pennsylvania (Lancaster) = *C. aparinoides* Pursh (1814) fide Torr., Fl. U. S. **1**: 237. 1824.

Campanula †aspera Donn, Hort. Cantab. ed. 4, 40. 1807, *nom. nud.*; Muhl., Cat. 22. 1813; ed. 2, 22. 1818, *nom.* ut syn. *C. erinoides* Linn. = *C. aparinoides* Pursh (1814), fide Torrey, l. c.

Cantua *inconspicua Muhl., Cat. 22. 1813; ed. 2, 21. 1818, *nom. nud.* No locality given. Prob. = *C. coronopifolia* Willd. (1798) = *Gilia rubra* (Linn.) Heller.

Carduus *luteus Muhl. in Trans. Am. Philos. Soc. **3**: 176. 1793, *nom. nud.* Pennsylvania (Lancaster). Prob. = *Cirsium spinosissimum* (Walt.) Scop.

This was clearly indicated by Muhlenberg as a new species.

Carduus †odoratus Muhl. ex Torr. & Gray, Fl. N. Am. **2**: 459, 1843, *nom.* in syn. (recte *Cnicus odoratus* Muhl.) = *Cirsium pumilum* (Nutt.) Spreng.

The Index Kewensis reference is "Muhl. Cat. Darl. Fl. Ces. 85", but both Muhlenberg and Darlington used the binomial *Cnicus odoratus*. Porter also transferred the species to *Carduus*, as *C. odoratus* Porter in Mem Torr. Bot. Club **5**: 345. 1894.

Carex *aristata Schreb. ex Muhl. in Trans. Am. Philos. Soc. **3**: 179. 1793, *nom. nud.* Pennsylvania (Lancaster).

Carex *curvicollis Schreb. ex Muhl. l. c., *nom. nud.* Pennsylvania (Lancaster).

Carex †erinacea Muhl. ex Schkuhr, Riedgr. Nachtr. 69. 1806, *nom.* in syn; Muhl. ex Pursh, Fl. Am. Sept. **1**: 43. 1814, *nom.* in syn. = *C. hystericina* Muhl. ex Willd. (1805).

The Index Kewensis entry is Muhl. ex Steudel, Nomencl. ed. 2, **1**: 288. 1840.

Carex †fulva Muhl., Cat. 83. 1813; ed. 2, 88. 1814, *nom. nud.*; Descr. Gram. 246. 1817, *descr.* Georgia = *C. elliottii* Schwein. & Torr. (1825).

Carex †lagopus Muhl., Cat. 84. 1813; ed. 2, 88. 1818, *nom. nud.*; Descr. Gram. 265. 1817, *descr.* West Virginia (not Pennsylvania) = *C. fraseri* Andr. (1811) (*Cymophyllus fraseri* Mackenzie).

Carex *paleacea Schreb. ex Muhl. in Trans. Am. Philos. Soc. **3**: 179. 1793, *nom. nud.* Pennsylvania (Lancaster).

From the locality this could not be the same as *Carex paleacea* Wahl. (1803).

Carex †plantaginea Muhl., Cat. 11. cc., *nom. nud.*; Descr. Gram. 245. 1817, *descr.* Pennsylvania, Virginia, Carolina = *C. anceps* Muhl. = *C. laxiflora* Lam.

Carex †polymorpha Muhl., Descr. Gram. 239. 1817, *descr.* Pennsylvania.

A valid species extending from Maine to Pennsylvania and Maryland. The Index Kewensis entry is Muhl. ex Boott, Illus. Carex **1**: 21. *pl. 57.* 1858.

Carex †recurva Muhl., Cat. 11. cc., *nom. nud.*; Descr. Gram. 262. 1817, *descr.*; non Huds., 1778, nec Schkuhr, 1801. Pennsylvania, et ex Descr. Gram. Cherokee (Northern Georgia) = *C. cherokeensis* Schwein. (1824).

Carex *varia Schreb. ex Muhl. in Trans. Am. Philos. Soc. **3**: 179. 1793, *nom nud.*; Muhl. ex Wahl. in Svensk. Vet. Akad. Nya Handl. **24**: 159. 1803; non Lumnitzer, 1791, nec. Host, 1801. Pennsylvania (Lancaster) = *C. artitecta* Mackenzie (1935).

We suspect that Muhlenberg entered this species from one of Schreber's lists of identifications, but Wahlenberg described it as Muhlenberg's species.

Carex †verrucosa Muhl., Cat. 11. cc., *nom. nud.*; Descr. Gram. 261. 1817, *descr.* Carolina, Georgia.

A valid species now known from South Carolina to Florida and Louisiana.

Cassia †aspera Muhl., Cat. 42. 1813: ed. 2, 42. 1818, *nom. nud.*; Muhl. ex Ell., Sketch **1**: 474. 1817, *descr.* Carolina, Georgia (*Chamaecrista aspera* Greene).

Cassia *discolor Donn, Hort. Cantab. ed. 4, 95. 1807, *nom. nud.*; Muhl., Cat. 42. 1813; ed. 2, 42 1818, *nom.* Pennsylvania.

Ceanothus *corymbosus Muhl., Cat. 25. 1813; ed. 2, 24. 1818, *nom. alt. C. intermedius* Muhl. = seq.

Ceanothus *intermedius Muhl. ll. cc., *nom. nud.*: Pursh, Fl. Am. Sept. **1**: 167. 1814, *descr.*; Muhl. ex Ell., Sketch **1**: 291. 1817, *descr.* Virginia, Georgia (Tennessee, fide Pursh).

Pursh's species extends southward to Florida. Elliott's entry is "intermedius, Muhl. Cat." but he also gives a reference to "Pursh 1. p. 167." We suspect that Muhlenberg originated the specific name; see p. 27.

Cerastium *hybridum Muhl. in Trans. Am. Philos. Soc. **3**: 170. 1793, *nom. nud.* Pennsylvania (Lancaster) = ? *C. arvense* Linn., fide A. Gray.

This was indicated by Muhlenberg as a new species.

Cerastium †longependunculatum Muhl., Cat. 46. 1813; ed. 2, 47. 1818, *nom. nud.*; Muhl. ex Barton, Fl. Phila. Prodr. 52. 1815, *descr.* = *C. nutans* Raf. (1814), fide Torrey, Cat. Pl. N. Y. 44. 1819.

Britton and Brown, Ill. Fl. U. S. ed. 2, **2**: 48. 1913, retain Muhlenberg's name, but it being a *nomen nudum* until 1815 we consider this to be inadmissable. *Cerastium nutans* Raf. was described a year earlier.

Cerastium *villosum Muhl., Cat. 11. cc., *nom. nud.*; Pennsylvania = *C. oblongifolium* Torr. & Gray, Fl. N. Am. **1**: 188. 1838 = *C. velutinum* Raf. (1808).

Torrey and Gray cite Muhlenberg's binomial as a synonym of their *Cerastium oblongifolium.*

Chelone †latifolia Muhl., Cat. 58. 1813; ed. 2, 60. 1818, *nom. nud.*; Muhl. ex Ell., Sketch **2**: 127. 1822, *descr.* Carolina = *C. lyonii* Pursh (1814).

Chenopodium *paniculatum Muhl., Cat. 28. 1813; ed. 2, 28. 1818, *nom. nud.* Pennsylvania.

Chenopodium *tenuifolium Muhl., Cat. 29. 1813; ed. 2, 28. 1818, *nom. nud.* New England, New Jersey.

Chironia †stellata Muhl., Cat. ed. 2, 23. 1818, *nom. nud.* New York, New Jersey, Georgia = *Sabatia stellaris* Pursh (1814), fide Torrey, Fl. U. S. **1**: 217. 1824.

The Index Kewensis entry is incomplete, taken from A. Gray, Syn. Fl. N. Am. **2** (1): 115. 1878, where Muhlenberg's binomial is cited as a synonym.

Chironia *venosa Muhl., Cat. ed. 1, 24. 1813; ed. 2, 23. 1818, *nom. nud.* New Jersey, Tennesse, Carolina = *Sabatia corymbosa* Baldw., fide Torrey, Fl. U. S. **1**: 219. 1821 = *S. lanceolata* (Walt.) Torr. & Gray.

Chrysocoma *denudata Muhl., Cat. 72. 1813; ed. 2, 75. 1818, *nom. nud.* Carolina.

Cimicifuga †americana Muhl., Cat. 53. 1813; ed. 2, 54. 1818, *nom. nud.* Carolina, Tennessee = *C. cordifolia* Pursh (1814).

Claytonia *spatulata Donn, Hort. Cantab. ed. 5, 53. 1809, *nom. nud.*; Muhl., Cat. ed. 1, 27. 1813; ed. 2, 26. 1818, *nom.* in syn. sub. *C. caroliniana* Michx.; Eaton, Man. ed. 2, 207. 1818; ed. 3, 240. 1822; ed. 4, 263. 1824, *descr.* = *C. caroliniana* Michx. (1803).

Clematis *pensilvanica Muhl. in Trans. Am. Philos. Soc. **3**: 172. 1793, *nom. nud.* Pennsylvania (Lancaster). An *C. pensylvanica* Donn, Hort. Cantab. ed. 4, 129. 1807, *nom. nud.*?

Muhlenberg indicated this as a new species.

Clematis *triternata Donn, Hort. Cantab. ed. 5, 137. 1809, *nom. nud.*; Muhl., Cat. 54. 1813; ed. 2, 56. 1818, *nom. nud.* North America. Prob. = *C. triternata* DC. Syst. **1**: 150. 1818, *descr.* = ? *C. crispa* Linn.

De Candolle's short description was based on a specimen cultivated in France. The status of the species is uncertain, but we suspect that *Clematis crispa* Linn. is the one represented (*Viorna crispa* Small).

Cleome †cuneifolia Muhl., Cat. 61. 1813; ed. 2, 64. 1818, *nom. nud.*; Muhl. ex Nutt., Gen. N. Am. Pl **2**: 73. 1818, *descr.*; Muhl. ex Ell., Sketch **2**: 150. 1822, *descr.* Georgia = *Warea cuneifolia* (Muhl.) Nutt.

Clinopodium *monardella Muhl., Cat. 56. 1813; ed. 2, 58. 1818, *nom. nud.* Carolina.

Clinopodium *montanum Muhl. ll. cc., *nom. nud.* Carolina.

Cnicus *horridus Muhl., Cat. 70. 1813; ed. 2, 73. 1818, *nom.* (*Carlina* [*foliis sessilibus sinuatus*] Gronov. Fl. Virgin., ed. 2, 117. 1762). New England, Pennsylvania, Virginia, Carolina = *Cirsium spinosissimum* (Walt.) Scop. (*Cnicus horridulus* Pursh, 1814).

Cnicus *lutescens Muhl., Cat. 11. cc. *nom. alt.* praec. = praec.

Cnicus †muticus Muhl., Cat. 11. cc. *nom. nud.* [*Cirsium muticum* Michx]; Pursh, Fl. Am. Sept. **2**: 506. 1814, *descr.*; Ell., Sketch **2**: 268. 1822, *descr.* Pennsylvania, Carolina = *Cirsium muticum* Michx.

Cnicus †odoratus Muhl., Cat. 11. cc. *nom. nud.*; Muhl. ex Barton, Compend. Fl. Phila. **2**: 95. 1818, *descr.*; Steud., Nomencl. ed. 2, **1**: 388. 1840, *nom.* Pennsylvania = *Cirsium pumilum* (Nutt.) Spreng. (*Carduus pumilus* Nutt., Gen. **2**: 130. 1818.)

Cnicus †virginianus Muhl., Cat. 11. cc., *nom. nud.* [*Cirsium virginianum* Michx.]; Pursh, Fl. Am. Sept. **2**: 506. 1814, *descr.* Pennsylvania, Virginia, Carolina Cher[okee] (Northern Georgia) = *Cirsium virginianum* (Linn.) Michx.

Conyza *camphorata Muhl., Cat. 72. 1813; ed. 2, 76. 1818, *nom.* (*Erigeron camphor*[*atus*] Linn.); Pursh, Fl. Am. Sept. **2**: 523. 1814, *descr.* New Jersey, Pennsylvania, Virginia, Carolina = *Pluchea camphorata* (Linn.) DC.

Corydalis †formosa Muhl., Cat. 63. 1813; ed. 2, 66. 1818, *nom. alt. C. rosea* Muhl.; Pursh, Fl. Am. Sept. **2**: 462. 1814, *descr.* New York, Tennessee = *Dicentra eximia* (Ker) DC.

Corydalis †glauca Muhl., Cat. 11. cc. *nom. nud.*; Pursh, op. cit. 463, *descr.* Pennsylvania = *C. sempervirens* (Linn.) Pers.

Here Muhlenberg may have been the originator of these two *Corydalis* binomials; see p. 27.

Corydalis *rosea Muhl., Cat. 11. cc. *nom. alt. C. formosa* Muhl. = *Dicentra eximia* (Ker) DC.

Crataegus *prunifolia Pers., Syn. **2**: 37. 1806 [1807], *descr.* [*Mespilus prunifolia* Poir. in Lam., Encycl. **4**: 443. 1797]; Muhl., Cat. 49. 1813; ed. 2, 50. 1818, *nom. nud.*; Bosc ex DC., Prodr. **2**: 627. 1825. Carolina.

This is probably not the same as the earlier *Crataegus prunifolia* Yong [Young], Cat. Arb. Am. 7. 1783. The entire description of the latter is: "Cet arbuste a 15 pieds de haut, il est épineux, a de jolies fleurs, & croit sur toutes sortes de sols."

Cyclamen *americanum Muhl., Cat. 19. 1813; ed. 2, 19. 1818, *nom. nud.* Canada.

Cynanchum *renifolium Muhl., 11. cc., *nom. nud.* No locality given.

Perhaps this is the same as *Gonolobus pubiflorus* (Decne.) Engelm. (*Edisonia pubiflora* Small).

Cyperus †erythorhizos Muhl., Cat. 6. 1813; ed. 2, 6. 1818, *nom. nud.*; Descr. Gram. 20. 1817, *descr.* Pennsylvania, Carolina, Georgia.

A valid species now known from New England to Ontario and Minnesota southward to Florida and Texas.

Cyperus †gracilis Muhl., Cat. 11. cc., *nom. nud.*; Descr. Gram. 18. 1817, *descr.*; Muhl. ex Ell., Sketch **1**: 68. 1816, *descr.* Carolina, Georgia = *C. haspan* Linn.

Cyperus †inflexus Muhl., Cat. 11. cc., *nom. nud.*; Descr. Gram. 16. 1817, *descr.* Pennsylvania, Cherok[ee] (Northern Georgia).

Cyperus *mollis Muhl. in Trans. Am. Philos. Soc. **3**: 160. 1793, *nom. nud.* Pennsylvania (Lancaster).

This was indicated by Muhlenberg as a new species.

Cyperus *nutans Muhl., l. c., *nom. nud.* Pennsylvania (Lancaster).

This was also indicated by Muhlenberg as a new species.

Cyperus †parviflorus Muhl., Cat. 11. cc., *nom. nud.*; Descr. Gram. 19. 1817, *descr.*; Muhl. ex Barton, Fl. Phila. Prodr. 17. 1815, *descr.*; non Vahl (1806). Massachusetts, Pennsylvania = *C. dentatus* Torr. (1824).

Torrey's name was proposed because of Vahl's prior use of the same name for a different species.

Cyperus †phymatodes Muhl., Cat. 11. cc., *nom. nud.*; Descr. Gram. 23. 1817, *descr.* Pennsylvania = *C. esculentus* Linn.

Cyperus †tenuis Muhl., Cat. 11. cc., *nom. nud.*: Descr. Gram. 22. 1817, *descr.*,non Sw. (1788). Pennsylvania, Virginia = *C. nuttalii* Eddy (1820) = *C. filicinus* Vahl (1806).

Dalibarda †lobata Muhl., Cat. ed. 2, 52. 1818, *nom. nud.*; Baldw. ex Ell., Sketch **1**: 571. 1821, *descr.* Georgia = *Waldsteinia lobata* (Baldw.) Torr. & Gray.

Probably here Muhlenberg intended to record Baldwin's species, as both he and Elliott had sets of Baldwin's specimens.

Dentaria †laciniata Muhl. ex Willd., Sp. Pl. **3**: 479. 1800, *descr.*; Muhl., Cat. 60. 1813; ed. 2, 63. 1818, *nom.* New England, Pennsylvania, Carolina.

The references in Index Kewensis are reversed. The species is now known from Quebec and New England to Minnesota, southward to Florida and Louisiana.

Dentaria †multifida Muhl., Cat. 11. cc., *nom. nud.*; Muhl. ex Nutt., Gen. **2**: 66. 1818, *nom nud.*; Muhl. ex Ell., Sketch **2**: 142. 1822, *descr.* Carolina, Cherok[ee] (Northern Georgia).

A valid species of the Appalachian region, now also known from Ohio and from Alabama.

Dichroma †cespitosum Muhl., Cat. 6. 1813; ed. 2, 6. 1818, *nom. nud.*; Descr. Gram. 14. 1817, *descr.* Georgia = *Bulbostylis stenophyllus* (Ell.) Fernald in Rhodora **40**: 391. 1938.

Elliott reduced Muhlenberg's species to his own, his description of *Scirpus stenophyllus* Ell., Sketch **1**: 83. 1816 having one year's priority over that of Muhlenberg.

Dichroma *stellatum Muhl., Cat. 11. cc., *nom. nud.* Florida.

Digitaria †ischaemum Muhl., Cat. 9. 1813; ed. 2, 9. 1818, *nom. nud.* [*Panicum ischaemum* Schreb.]; Schreb. ex Muhl., Descr. Gram. 131. 1817, *descr.* = *D. ischaemum* (Schreb.) Muhl.; Hitchcock in Bartonia **14**: 42. 1932.

Diodia †hispida Muhl., Cat. 15. 1813; ed. 2, 14. 1818, *nom. nud.*; Ell., Sketch **1**: 191. 1816, *nom.* in syn.; DC., Prodr. **4**: 562. 1830, *nom.* in syn. = *D. hirsuta* Pursh (1814).

Dioscorea †glauca Muhl., Cat. 92. 1813; ed. 2, 97. 1818, *nom. nud.*; Eaton, Man. ed. 2, 233. 1818, *descr.*; ed. 3, 267. 1822, *descr.*; ed. 4, 287. 1824, *descr.*

Recognized by Bartlett in 1910, and by Small in 1913 as a valid species. Pennsylvania to Missouri, Arkansas, and South Carolina.

Diospyros †caroliniana Muhl., Cat. 96. 1813; ed. 2. 101. 1818, *nom. nud.*; Raf., Fl. Ludovic. 139. 1817, *nom.* in syn. Carolina, Mississippi = *D. virginiana* Linn.

Dolichos *sphaerospermus Muhl., Cat. 64. 1813; ed. 2, 67. 1818, *nom.* (*Phaseolus* [*sphaerospermus* Linn.]); DC., Prodr. **2**: 400. 1825. Pennsylvania = *Vigna unguiculata* (Linn.) Walp.

Draba †bifolia Muhl. in Trans. Am. Philos. Soc. **3**: 173. 1793, *nom. nud.* (Ind. Kew. **1**: 793 "Ind. Fl. Lanc. 173"). Pennsylvania (Lancaster). Prob. = *D. caroliniana* Walt. (1788).

Draba †umbellata Muhl., Cat. 60. 1813; ed. 2, 62. 1818, *nom.* (*D. caroliniana* Walt.). Pennsylvania, Carolina = *D. caroliniana* Walt.

Eleusine *erucaeformis Muhl., Cat. 12. 1813; ed. 2, 11. 1818, *nom. nud.* No locality indicated.

The basis of this name was probably *Phalaris erucaeformis* Linn. = *Beckmannia erucaeformis* Host. The American form long confused with the latter is *Beckmannia syzigachne* (Steud.) Fernald in Rhodora **30**: 27. 1928.

Eleusine †sparsa Muhl. Cat. 11. cc., *nom.* (*E. filiformis* Pers.); Descr. Gram. 135. 1817, *descr.* Carolina, Georgia Cher[okee] (Northern Georgia) = *Leptochloa filiformis* (Lam.) Beauv.; see Hitchcock in Bartonia **14**: 42. 1932.

†Elliottia Muhl., Cat. 40. 1813; ed. 2, 40. 1818, *nom. nud.*; Muhl. ex Ell., Sketch **1**: 448. 1817, *descr.*; Muhl. ex Nutt., Gen. **2**: Add [4]. 1818, *descr.*

Elliottia †racemosa Muhl., Cat. 11. cc., *nom. nud.*; Muhl. ex Ell., Sketch, 1. c., *descr.* Georgia.

A monotypic genus known only from South Carolina and Georgia.

Elymus *ciliatus Muhl., Cat. 4. 1813; ed. 2, 13. 1818, *nom. nud.*; Descr. Gram. 179. 1817, *descr.* Carolina, Cher[okee] (Northern Georgia).

A species of doubtful status; see Hitchcock, Bartonia **14**: 48. 1932.

Elymus *pilosus Muhl. in Trans. Am. Philos Soc. **2**: 161. 1793, *nom. nud.* Pennsylvania (Lancaster).

This might be the same as the species later described by Muhlenberg as *Elymus villosus* Muhl., the type of which was from Pennsylvania.

Elymus *striatus Schreb. ex Muhl. 1. c., *nom. nud.* Pennsylvania (Lancaster) = *E. striatus* Willd., Sp. Pl. **1**: 470. 1797, *descr.* = *E. virginicus* Linn.

Epipactis *pubera Muhl., Cat. 81. 1813; ed. 2, 85. 1818, *nom. nud.* [*Ophrys *pubera* Michx., Fl. Bor. Am. **2**: 158. 1803]. No locality indicated by Muhlenberg; Georgia, fide Michaux = *Ponthieva glandulosa* (Walt.) Mohr.

Confident that Muhlenberg derived his specific name from the Michaux binomial, we have placed the latter in square brackets; it is rather curious that Michaux's binomial, which was definitely published as new, is still unlisted in standard indices.

Erianthus †giganteus Muhl., Cat. 4. 1813; ed. 2, 4. 1818, *nom.* (*Anthoxanthum giganteum* Walt.; *Andropogon alope*[*curoides*] Linn.); Descr. Gram. 192. 1817, *descr.* Virginia, Carolina.

This is *Erianthus giganteus* (Walt.) Muhl. (*E. saccharoides* Michx.); see Hitchcock in Bartonia **14**: 49. 1932, and our discussion, p. 25.

Erigeron *asteroides Ell. ex. Muhl., Cat. ed. 2, 76, 1818, *nom. nud.*, sphalm. "astervideum." Carolina, Georgia = *Boltonia asteroides* (Linn.) L'Herit.

The entry in Muhlenberg's Catalogus is somewhat confused "astervideum Elliot, vel punctatum, venosum."

Erigeron *flexuosus Muhl., Cat. 73. 1813; ed. 2, 76. 1818, *nom. alt. E. stoloniferus* Muhl.

This has nothing to do with *Erigeron flexuosus* Cronquist in Brittonia **6**: 174. 1947; neither of Muhlenberg's specific names are accounted for by Cronquist.

Erigeron *punctatus Muhl. Cat. ed. 2, 76. 1818, *nom. alt. E. asteroides* Ell. ("astervideum") = *Boltonia asteroides* (Linn.) L'Hérit.

Erigeron *stoloniferus Muhl., Cat. 73. 1813; ed. 2, 76. 1818, *nom. nud.* No locality indicated.

Erigeron *venosus Muhl., Cat. ed. 2, 76. 1818, *nom. alt. E. asteroides* Ell. ("astervideum") = *Boltonia asteroides* (Linn.) L'Hérit.

Erinus *pinnatifidus Muhl., Cat. 59. 1813; ed. 2, 61. 1818, *nom. nud.* Georgia.

Eryngium *tenue Muhl., Cat. ed. 2, 29. 1818, *nom. nud.* Georgia = *E. baldwinii* Spreng. (1825).

This is probably Muhlenberg's name for the species described by Baldwin, one of his correspondents, as *E. gracile* Baldw. ex Ell., Sketch **1**: 345. 1821, non Lam., 1798 = *E. baldwini* Spreng.

Euonymus *angustifolius Lyon ex Muhl., Cat. 25. 1813; ed. 2, 24. 1818, *nom. nud.*; Pursh, Fl. Am. Sept. **1**: 168. 1814, *descr.* Georgia, ex Pursh = *E. americanus* Linn. var. *angustifolius* (Pursh) Wood.

Pursh had specimens from Lyon, and we suspect that they bore Lyon's specific name.

Euphorbia *claytoni Muhl., Cat. 47. 1813; ed. 2, 48. 1818, *nom. alt. E. lutescens* Muhl.

Euphorbia *coccinea Muhl., Cat. 11. cc., *nom. nud.* Georgia..

Euphorbia *lutescens Muhl., 11. cc., *nom. nud.* Pennsylvania.

Fagus *carpinifolia Muhl., Cat. 86. 1813; ed. 2, 91. 1818, *nom. nud.* No locality given.

Festuca †brevifolia Muhl., Cat. 13. 1813; ed. 2, 12. 1818, *nom. nud.*; Descr. Gram. 167. 1817, *descr.* New York, Delaware, Georgia = *Triplasis purpurea* (Walt.) Chapm.; see Hitchcock in Bartonia **14**: 46. 1932.

Festuca †clandestina Muhl., Cat. 11. cc., *nom. nud.*; Descr. Gram. 162. 1817, *descr.* New York = *Leptochloa fascicularis* (Lam.) A. Gray; see Hitchcock, 1. c.

Festuca *obtusa Muhl. in Trans. Am. Philos. Soc. **3**: 161. 1793, *nom. nud.* Pennsylvania (Lancaster).

This is undoubtedly the same as *Festuca obtusa* Spreng., Mant. Fl. Hal. 34. 1807, which was based on a Muhlenberg specimen.

Festuca †procumbens Muhl., Cat. 11. cc., *nom. nud.*; Descr. Gram. 160. 1817, *descr.* Carolina = praec.; see Hitchcock, op. cit., 45.

Festuca *tenella Schreb. ex Muhl. in Trans. Am. Philos. Soc. **3**: 161. 1793, *nom. nud.*; Willdenow, Sp. Pl. **1**: 419. 1797, *descr.* Pennsylvania (Lancaster) = *F. octoflora* Walt. (1788); see Hitchcock, 1. c.

Frasera *verticillata Muhl., Cat. 17. 1813, ed. 2, 17. 1818, *nom. nud.* (sphalm. "vertillata"). Pennsylvania, Ohio, Tennessee, Carolina. = *F. walteri* Michx., fide Beck, Bot. N. Mid. States 241. 1833 = *F. verticillata* Raf., Med. Fl. 1: 196. *f. 39.* 1828 = *F. carolinensis* Walt. (1788).

Fraxinus *australis Muhl., Cat. 96. 1813; ed. 2, 101. 1818, *nom. nud.* No locality indicated.

Fraxinus †concolor Muhl., Cat. 11. cc., *nom. nud.* (haud "Muhl., Cat. Pl. Am. Sept. iii. 115. t. 11" ut in Ind. Kew.); Torr., Fl. N. Y. **2**: *pl. 90.* 1843. Pennsylvania = *F. pennsylvanica* Marsh. (1785) (*F. pubescens* Lam. 1788).

Apparently Torrey accepted Muhlenberg's name which appears on the cited plate only, but without authority. In the descriptive text it appears as *Fraxinus pubescens* Walt.? This may or may not be the same as *F. pubescens* Lam., both Walter's and Lamarck's binomials having been published in the same year.

Fraxinus †discolor Muhl., Cat. 11. cc., *nom. nud.* Pennsylvania = *F. americana* Linn., fide Bigelow, Fl. Bost. 249. 1814.

Fraxinus *sericea Muhl., Cat. 11. cc., *nom. nud.* "Western Black ash". No locality indicated. = ? *F. nigra* Marsh. (1785).

Galactia †pinnata Muhl., Cat. 65. 1813; ed. 2, 67. 1818, *nom. nud.* Carolina, Georgia = *G. elliottii* Nutt. (1818).

We suspect that here Muhlenberg thought that he was recording *Galactia pinnata* Pers., Syn. **2**: 302. 1807, a West Indian species. See Elliott's comment on Muhlenberg's name, Sketch **2**: 240. 1822.

Galium †brachiatum Muhl., Cat. 16. 1813; ed. 2, 15. 1818, *nom. nov. G. circaezans* Michx. New England, Pennsylvania, Carolina = *G. circaezans* Michx.

Gentiana †alba Muhl., Cat. 29. 1813, ed. 2, 29. 1818, *nom. nud.*; Muhl. ex Nutt., Gen. **1**: 172. 1818, *descr.* Pennsylvania = *Gentiana andrewsii* Griseb. (*Dasystephana andrewsii* Small).

Possibly here Muhlenberg was recording the earlier *Gentiana alba* Yong [W. Young], Arb. Am. 36. 783.

Gentiana *glandulosa Muhl. in Trans. Am. Philos. Soc. **3**: 165. 1793, *nom. nud.* Pennsylvania (Lancaster).

This was indicated as a new species. Muhlenberg added "varietas ciliatae?", but *G. ciliata* Linn. is a European species.

Gentiana *phoenicea Muhl. l. c., *nom. nud.* Pennsylvania (Lancaster).

This was also indicated as a new species.

Gerardia *heterophylla Muhl., Cat. 11. cc., *nom. alt. G. villosa* Muhl.; Ell., Sketch **2**: 120. 1822, *nom.* in syn. New York, Pennsylvania = *Aureolaria virginica* (Linn.) Pennell.

This has nothing to do with *Gerardia heterophylla* Nutt. (1834).

Gerardia *lanceolata Muhl. ex Raf., New Fl. N. Am. **2**: 59. 1836 [1837], *nom.* in syn., sphalm. = seq.

Gerardia *lancifolia Muhl., Cat. 11. cc., *nom. nud.* Cherokee (Northern Georgia); Nutt., Gen. **2**: 48. 1818, *nom.* ut syn. *G. cuneifolia* Pursh. (Northern Georgia) = *Mecardonia acuminata* (Walt.) Small = *Pagesia acuminata* (Walt.) Pennell.

This has nothing to do with the later *Gerardia lancifolia* Greene (1899) which is a synonym of *G. tenuifolia* Vahl. var. *macrophylla* Benth.

Gerardia †villosa Muhl., Cat. 11. cc., *nom. nud.*; Raf., New Fl. N. Am. **2**: 59. 1836 [1837], *nom.* in syn. (*Aureolaria villosa* Raf.). New York, Pennsylvania = *Aureolaria virginica* (Linn.) Pennell.

Glechoma *cordifolia Muhl., Cat. 55. 1813; ed. 2, 57. 1818, *nom. nud.* Pennsylvania = *G. hederacea* Linn. (*Nepeta glechoma* Benth.).

This is undoubtedly the same as the form Eaton described as *Glechoma *cordata* Eaton, Man. ed. 2, 259. 1818, which in ed. 3, 292. 1822, he credited to Muhlenberg.

Glycine *parabolica Muhl. ex Barton, Fl. Phila. Prodr. 71. 1815, *descr.* Pennsylvania.

Glycine *simplicifolia Muhl., Cat. 64. 1813; ed. 2, 67. 1818, *nom. nud.* Carolina.

Gordonia *franklinia Muhl., Cat. 63. 1813; ed. 2, 65. 1818, *nom. nud.*; Eaton, Man. 78. 1817, *descr.* Georgia, Pennsylvania (cult.) = *Gordonia franklini* L'Hérit. = *Franklinia alatamaha* Bartram ex Marshall (1785).

This is undoubtedly the source of Eaton's name which Merrill and Reeder, Bartonia **24**: 61. 1947, credited to him.

Gratiola †aurea Muhl., Cat. 2. 1813; ed. 2, 2. 1818, *nom.* (*G. officinalis* sensu Michx.); Muhl. ex Bigel., Fl., Bost. 6. 1814, *descr.*; Muhl. ex Barton, Fl. Phila. Prodr. 14. 1815, *descr.*; Pursh, Fl. Am. Sept. **1**: 12. 1814, *descr.*; Muhl. ex Ell., Sketch **1**: 13. 1816, *descr.*; Le Conte in Ann. Lyc. Nat Hist. N. Y. **1**: 106. 1824, *descr.* New England, New Jersey, Carolina = *G. lutea* Raf. (1811).

We suspect that Pursh appropriated Muhlenberg's specific name as his own. All early American botanists, Bigelow, Barton, Elliott, Torrey, Beck and Chapman, credit Muhlenberg with originating the name; see p. 27.

Gratiola *viscida Muhl., Cat. ed. 2, 2. 1818, *nom. nud.* Carolina. Prob. = *G. viscidula* Pennell.

This is doubtless the species described in 1824 as *G. viscosa* Schwein. ex Le Conte in Ann. Lyc. Nat. Hist. N. Y. **1**: 106. 1824 (non Hornem., 1807), from Virginia and North Carolina = *G. viscidula* Pennell (1919), which extends from Delaware to northern Georgia.

Hedysarum †humifusum Muhl., Cat. 66. 1813; ed. 2, 69. 1818, *nom. nud.*; Muhl. ex Bigel., Fl. Bost. ed. 2, 274. 1824, *descr.* Pennsylvania, Carolina = *Desmodium humifusum* (Muhl.) Beck, Bot. U. S. 86. 1833 = *D. glabellum* Michx. (1803).

Heysarum *lancifolium Muhl., Cat. 11. cc., *nom. nud.* Delaware, Carolina.

Hedysarum *oblongifolium Muhl., Cat. 11. cc., *nom. nud.* Pennsylvania.

Helleborus *trifoliatus Muhl., Cat. 55. 1813; ed. 2, 56. 1818, *nom. nud.* [*H. trifolius* Linn.].; Eaton, Man. 62. 1817, *descr.* New England, Pennsylvania = *Coptis trifolia* (Linn.) Salisb., quoad nom. = *C. groenlandica* (Oeder) Fernald in Rhodora **31**: 142. 1929, quoad spec.

This is unquestionably the source of Eaton's name of 1817 that Merrill and Reeder in Bartonia **24**: 62. 1947 there credited to him.

Heteranthera *ovalis Muhl., Cat. 5. 1813; ed. 2, 5. 1818, *nom. nud.* Illinois, Missouri = *H. reinformis* Ruiz & Pavon.

We suspect that the source of this name was *Leptanthus ovalis* Michx.; see Merrill and Reeder in Bartonia **24**: 62. 1947, under discussion of *Heteranthera ovalis* Eaton (1829); this is doubtless the source of Eaton's name.

Heuchera *hispida Muhl., Cat. 29. 1813; ed. 2, 29. 1818, *nom. nud.*; Pursh, Fl. Am. Sept. **1**: 188. 1814, *descr.* Carolina = *H. hispida* Pursh.

We suspect that here Pursh appropriated Muhlenberg's name. He says his specimens were from the high mountains of Virginia and Carolina. Small, Man. Southeast. Fl. 594. 933, says: "It is not definitely known from our range" (North Carolina southward).

Hibiscus †carolinianus Muhl., Cat. 63. 1813; ed. 2, 65. 1818, *nom. nud.*; Muhl. ex Ell., Sketch **2**: 168. 1822, *descr.* Pennsylvania, Carolina, Georgia = *H. militaris* Cav. (1787).

Holcus *tener Schreber ex Muhl. in Trans. Am. Philos. Soc. **3**: 182. 1793, *nom. nud.* Pennsylvania (Lancaster).

Houstonia *divaricata Donn, Hort. Cantab. ed. 4, 28. 1807, *nom. nud.*; Muhl., Cat. 15. 1813, ed. 2, 14. 1818, *nom. nud.* [North America].

Hydrocharis *cordifolia Muhl., Cat. 86. 1813; ed. 2, 90. 1818, *nom. nud.* Carolina = *H. cordifolia* Nutt., Gen. **2**: 241. 1817 = *Limnobium spongia* (Bosc) L. C. Rich.

Hydrocotyle *bipinnata Muhl. in Trans. Am. Philos. Soc. **4**: 236. 1799, *nom. nud.*; Cat. 30. 1813; ed. 2, 29. 1818, *nom. nud.*; Muhl. ex Barton, Fl. Phila. Prodr. 36. 1815, *nom. nud.*; Raf. in Med. Repos. II. **5**: 173. 1809, *nom. nud.* Pennsylvania (Lancaster) = *Erigenia bulbosa* (Michx.) Nutt.

This is apparently a case where Rafinesque appropriated Muhlenberg's binomial on the basis of a specimen given to him by the latter; see p. 26.

Hydrocotyle †interrupta Muhl., Cat. 11. cc., *nom.* in syn. sub "H. vulgaris?"; Muhl. ex Ell., Sketch **1**: 345. 1817, *descr.* Tennessee, Carolina, Georgia Cherok[ee] (Northern Georgia) = *H. verticillata* Thunb. (1798).

Hydrophyllum *pellucidum Muhl., Cat. 20. 1813; ed. 2, 19. 1818, *nom. nud.* No locality indicated.

Hydrophyllum †pusillum Muhl., Cat. 11. cc., *nom. nud.*; A. DC. in DC., Prodr. **9**: 289, 292. 1845, *nom.* in syn. Louisiana = *Ellisia microcalyx* Nutt. (1833) = *Nemophila microcalyx* (Nutt.) Fisch. & Mey.

Hydrophyllum *tomentosum Muhl., Cat. 11. cc., *nom. nud.* Tennessee.

Hypericum *bartramicum Muhl., Cat. 67. 1813; ed. 2, 70. 1818, *nom.* ut syn. *H. ascyroides* Linn. [Willd.]. Pennsylvania, Ohio = *Hypericum ascyron* Linn.

Muhlenberg may have used this name in the same sense as did Pursh in *H. bartramianum* Pursh (1814), which is apparently the same as *H. bartramium* Mill. (1768).

Hypericum *villosum Muhl., Cat. 68, 1813; ed. 2, 71. 1818, *nom. alt. H. simplex* Michx. Carolina = *H. setosum* Linn. (*H. pilosum* Walt.).

Ixia *aquatica Muhl. in Trans. Am. Philos. Soc. **3**: 160. 1793, *nom. nud.* Pennsylvania (Lancaster).

Juglans †pyriformis Muhl., Cat. 88. 1813; ed. 2, 92. 1818, *nom.* (*J. obcordata* Lam.). Pennsylvania = *Carya glabra* (Mill.) Spach.

Juglans *villosa Muhl., Cat. 11. cc., *nom.* ut syn. *J. alba* Linn. Pennsylvania = *Carya alba* (Linn.) K. Koch.

Muhlenberg gives the common name as mocker nut or common hickory.

Juncus †echinatus Muhl., Cat. 36. 1813; ed. 2, 36. 1818, *nom.* (*J. polycephalus* Michx.); Descr. Gram. 207. 1817, *descr.*; Muhl. ex Ell., Sketch **1**: 410. 1817, *descr.* Pennsylvania, Carolina, Georgia, Cherok[ee] (Northern Georgia) = *J. polycephalus* (Michx. 1803).

We suspect that the Pennsylvania record was based on specimens cultivated by Muhlenberg at Lancaster. The species occurs from Virginia to Florida and Texas. It is entered in Index Kewensis as *Juncus echinatus* Ell.

Juncus †subverticillatus Muhl., Cat. 11. cc., *nom. nud.*; Descr. Gram. 209. 1817, *descr.* (*J. fluitans* sensu Michx.). Pennsylvania = *J. pelocarpus* E. Mey. (1823).

Justicia †brachiata Pursh ex Muhl., Cat. 2. 1813; ed. 2, 2. 1818, *nom. nud.*; Pursh, Fl. Am. Sept. **1**: 13. 1814, *descr.* North Carolina, Pennsylvania (cult.) = *Diapedium brachiatum* (Pursh) O. Kuntze.

Here is a case where manifestly Muhlenberg had a specimen named by Pursh. See the discussion p. 27.

Justicia *ensiformis Muhl., Cat. 11. cc., *nom. nud.*; Ell., Sketch **1**: 11. 1816, *descr.* (*Dianthera ensiformis* Walt.). Carolina = *Dianthera americana* Linn. (*Justicia americana* Vahl).

Kyllinga †monocephala Muhl., Cat. 5. 1813; ed. 2, 5. 1818, *nom. nud.*; Descr. Gram. 3. 1817, *descr.* New Jersey, Carolina, Georgia.

Muhlenberg cited no synonyms but in 1817 added a reference "Lamarck Encl. 38, 1", i. e., Lam., Tabl. Encycl. **1**: *pl. 38. fig. Kyllingia* sp., thinking that what he had was *K. monocephala* Rottb. What he had was probably *K. odorata* Vahl, excluding the New Jersey record.

Lactuca †hirsuta Muhl., Cat. 69. 1813; ed. 2, 72. 1818, *nom. nud.*; Muhl. ex Nutt., Gen. N. Am. Pl. **2**: 124. 1818, *descr.* Pennsylvania.

A valid species extending from Quebec to Louisiana and Texas.

Lathyrus *pusillus Muhl., Cat. 1. 65. 1813; ed. 2, 68. 1818, *nom. nud.*; Mississippi. Prob. = *L. pusillus* Ell., Sketch **2**: 223. 1822, *descr.* North Carolina to Kansas, Florida and Texas.

Laurus *diospyrus Muhl., Cat. 2. 41. 1813; ed. 2, 41. 1818, *nom. nud.*; Pursh, Fl. Am. Sept. **1**: 276. 1814, *descr.* (*L. melissaefolia* Walt.; *L. diospyroides* Michx.). Carolina, Tennessee = *Lindera melissaefolia* (Walt.) Blume (*Benzoin melissaefolium* Nees).

Ledum *decumbens Donn, Hort. Cantab. ed. 2, 54. 1800, *nom. nud.*; Muhl., Cat. 43. 1813; ed. 2, 43. 1818, *nom. nud.*; Lodd. ex Steud., Nomencl. ed. 2, **2**: 20. 1841, *nom.* Hudson Bay = *L. palustre* Linn.

Limodorum †unifolium Muhl., Cat. 81. 1813; ed. 2, 85. 1818, *nom. nud.*; Muhl. ex Nutt., Gen. **2**: 195. 1818, *nom.* in syn. New Jersey to Georgia = *Tipularia discolor* (Pursh) Nutt.

Muhlenberg's *nomen nudum* of 1813 has no standing, hence we do not accept the name *Tipularia unifolia* (Muhl.) Britton, Sterns, & Poggenb., for this species. Correctly the nomenclature begins with the described *Orchis discolor* Pursh (1814).

Lindernia †attenuata Muhl., Cat. 59. 1813; ed. 2, 61. 1818, *nom. nud.*; Muhl. ex Barton, Fl. Phila. Prodr. 66. 1815, *descr.*; Muhl. ex Ell., Sketch **1**: 17. 1816, *descr.* Pennsylvania, Carolina = *L. dubia* (Linn.) Pennell, var. *major* (Pursh) Pennell.

Lindernia †dilatata Muhl., Cat. 11. cc., *nom. nud.*; Muhl. ex Ell., op. cit. 16, *descr.* Pennsylvania, Carolina = *L. anagallidea* (Michx.) Pennell.

Lindernia *monticola Muhl., Cat. 11. cc., *nom. nud.*; Muhl. ex Nutt., Gen. N. Am. Pl. **1**: 9. 1818, *nom.*; Nutt. op. cit. **2**: Add. [1]. 1818, *descr.* Carolina.

See Pennell in Acad. Nat. Sci. Phila. Monog. **1**: 156. 1935, who discusses this case. He offers no explanation of Nuttall's first reference to "*L. monticola* of the hills of New Hampshire" (= White Mountains). The description was based on a specimen from North Carolina. Torrey's full description, Fl. U. S. **1**: 15. 1824, was based on specimens collected by Schweinitz and Le Conte in North Carolina, as was Nuttall's brief characterization; and yet he says also "On the White Hills of New Hampshire. *Nuttall.*"

Linum †lewisii Muhl., Cat. 33. 1813; ed. 2, 33. 1818, *nom. nud.*; Pursh, Fl. Am. Sept. **1**: 210. 1814, *descr.* Missouri, Pennsylvania (cult.).

Pursh credits the binomial to himself. Muhlenberg grew the plant in his garden at Lancaster from Lewis and Clark expedition seeds. He may have had the name from Pursh.

Lobelia †pallida Schreb. ex Muhl. in Trans. Am. Philos. Soc. **3**: 178. 1793, *nom. nud.*; Muhl., Cat. 22. 1813; ed. 2, 22. 1818, *nom.* (*L. goodenioides* Willd.); Muhl. ex Bigel., Fl. Bost. 55. 1814 *descr.*; Muhl. ex Barton, Fl. Phila. Prodr. 30. 1815, *descr.*; Muhl. ex Ell., Sketch **1**: 265. 1817, *descr.* Pennsylvania (Lancaster) = *L. spicata* Lam. (1791).

Lonicera †ciliata Muhl., Cat. 23. 1813; ed. 2, 22. 1818, *nom. nud.* New England, New York, Pennsylvania = *L. canadensis* Marsh. (1785).

Pursh, Fl. Am. Sept. **1**: 161. 1814, described this as *Xylosteum ciliatum* Pursh, possibly deriving his specific name from Muhlenberg.

Lonicera †villosa Muhl., Cat. 11. cc., *nom. nud.* New York, Pennsylvania = *L. hirsuta* Eaton (1818).

This was reduced by Torrey and Gray in 1841 to *Lonicera hirsuta* Eaton (1818). New England to Pennsylvania and Manitoba.

Lyonia *coriacea Muhl., Cat. 45. 1813; ed. 2, 46. 1818, *nom.* ut syn. *Mylocarium ligustrinum* Willd. Georgia, Pennsylvania (cult.) = *Cliftonia monophylla* (Lam.) Sarg.

Malva *paniculata Bartram ex Muhl., Cat. 62. 1813; ed. 2, 65. 1818, *nom. nud.* Carolina.

Marshallia *angustifolia Muhl., Cat. 72. 1813; ed. 2, 75. 1818, *nom.* (*Persoonia* [*angustifolia*] Michx.); Pursh, Fl. Am. Sept. **2**: 520. 1814, *descr.* Carolina, Tennessee = *M. graminfolia* (Walt.) Small.

Marshallia *lanceolata Muhl., Cat. 11. cc., *nom.* (*Persoonia* [*lanceolata*] Michx.); Pursh, op. cit. 519, *desc.* Carolina, Georgia = *M. trinervia* (Walt.) Porter.

Marshallia *latifolia Muhl., Cat. 11. cc., *nom.* (*Persoonia* [*latifolia*] Michx.); Pursh, l. c., *descr.* Carolina = *M. trinervia* (Walt.) Porter.

Melampyrum †latifolium Muhl., Cat. 57. 1813; ed. 2, 59. 1818, *nom. nud.*; Muhl. ex Nutt., Gen. **2**: 58. 1818, *nom.*; Eaton, Man. ed. 2, 316. 1818, *descr.* Delaware = *M. lineare* Desr. var. *latifolium* (Muhl.) Beauverd.

Nova Scotia and Quebec westward to Wisconsin and Minnesota southward to South Carolina and Georgia.

Melananthera *hastata Michx., Fl. Bor. Am. **2**: 107. 1803; Muhl., Cat. 71. 1813, ed. 2, 74. 1818, *nom.*; Pursh, Fl. Am. Sept. **2**: 519. 1814, *descr.* Carolina, Georgia = *Melanthera *hastata* (Michx.) DC., Prodr. **5**: 545. 1836.

The entry in Index Kewensis is *Melanthera hastata* Michx., Fl. Bor. Am. **2**: 106, but Michaux in 1803 described *Melananthera* as a new genus, independently of the earlier and equivalent *Melanthera* Rohr (1792), and with a single species *Melananthera hastata* Michx.

Melica †racemosa Muhl., Cat. 11. 1813; ed. 2, 10. 1818, *nom. nud.*; Descr. Gram. 88. 1817, *descr.* Pennsylvania (cult.), Carolina, Cherok[ee] (Northern Georgia) = *M. mutica* Walt. (1786); see Hitchcock in Bartonia **14**: 35. 1932.

Menisperum *craniocarpon Muhl., Cat. ed. 2, 98. 1818, *nom. alt. M. dubium* Muhl. Mississippi = seq.

Menisperum †dubium Muhl., Cat. 93. 1813; ed. 2, 98. 1818, *nom. nud.*; Raf., Fl. Ludovic. 138. 1817, *nom. nud.* Mississippi.

Menziesia *empetrifolia Muhl., Cat. 40. 1813; ed. 2, 40. 1818, *nom. nud.* Western North America = *M. empetriformis* Sm. (1811) = *Bryanthus empetriformis* A. Gray = *Phyllodoce empetriformis* (Sm.) D. Don.

Mikania †pubescens Muhl., Cat. 71. 1813; ed. 2, 74. 1818, *nom. nud.*; Nutt., Gen. **2**: 136. 1818, *descr.*; Muhl. ex Ell., Sketch **2**: 293. 1822, *descr.* Pennsylvania, Carolina, Georgia = *M. scandens* (Linn.) Willd.

Nuttall published his *Mikania pubescens* independently of that of Muhlenberg, but may have derived his name from a Muhlenberg specimen.

Milium †ciliatum Muhl., Cat. 10. 1813; ed. 2, 9. 1818, *nom. nud.*; Descr. Gram. 77. 1817, *descr.*; non Moench, 1802. New Jersey = *Amphicarpum purshii* Kunth; see Hitchcock in Bartonia **14**: 33. 1932.

Milium †distichum Muhl., Cat. 11. cc., *nom. nud.*; Descr. Gram. 78. 1877, *descr.*; Ell., Sketch **1**: 104. 1816, *nom.* in syn. Carolina = *Paspalum distichum* Linn.; see Hitchcock, op. cit. 34.

Monotropa *morisonia Muhl., Cat. 42. 1813; ed. 2, 43. 1818, *nom. nud.* Carolina = *M. morisoni* Pers. (1805) = *M. morisoniana* Michx. (1803) = *M. uniflora* Linn.

Muhlenbergia *diffusa Muhl. in Trans. Am. Philos. Soc. **3**: 160. 1793, *nom. nud.*; Willd., Sp. Pl. **1**: 320. 1797, *descr.* Pennsylvania (Lancaster) = *M. schreberi* Gmel. (1791).

See Hitchcock in Bartonia **14**: 30. 1932, who correctly, as the species was there first published with a description, credits the binomial to Willdenow. Muhlenberg doubtless had the name from Willdenow in a list of identifications.

Muhlenbergia *erecta Muhl. in Trans. Am. Philos. Soc. **3**: 160. 1793, *nom. nud.*; Cat., 8. 1813; ed. 2, 7. 1818, *nom. nud.*; Descr. Gram. 57. 1817, *descr.* (*Dilepyrum aristosum* Michx.). Pennsylvania, Carolina, Georgia = *Brachyelytrum erectum* (Schreb.) Beauv.

This was indicated by Muhlenberg as a new species, but he probably received the name from Schreber for whom Sprengel published a description in 1807-08.

Myrica *parvula Muhl., Cat. ed. 2. 96. 1818, *nom. nud.* Carolina, Florida.
This is probably *Myrica pumila* Michx. (1803) (*Cerothamnus pumilus* Small).

Oenanthe †teretifolia Muhl., Cat. 32. 1813; ed. 2, 31. 1818, *nom. nud.* Carolina, Georgia = *Oxypolis filiformis* (Walt.) Britton.

Ophiorrhiza ***ovatifolia** Muhl., Cat. 20. 1813; ed. 2, 20. 1818, *nom. nud.*; Ell., Sketch **1**: 237. 1817, *nom.* in syn. sub *O. mitreola* Michx.; Ind. Kew. **2**: 353. 1894, ut "ovalifolia Muhl. Cat. 20" Carolina = *Cynoctonum mitreola* (Linn.) Britton.

Ophrys ***hyemalis** Muhl. in Trans. Am. Philos. Soc. **3**: 178. 1793, *nom. nud.* Pennsylvania (Lancaster).

This is undoubtedly the species described as *Cymbidium hyemale* Muhl. ex Willd. (1805) = *Aplectrum hyemale* (Muhl.) Torr.

Ophrys ***maculata** Muhl. 1. c., *nom. nud.* Pennsylvania (Lancaster).
Possibly this is the same as *Corallorhiza maculata* Raf. (1817) (*C. multiflora* Nutt., 1832).

Ophrys ***virginiana** Schreb. ex Muhl. 1. c., *nom. nud.* Pennsylvania (Lancaster).

Orchis ***pallida** Muhl. in Trans. Am. Philos. Soc. **3**: 178. 1793, *nom.* ("Clayton, 136, n. 200?", i. e. *Orchis foliis duobus inferioris ovatis* Gronov. Fl. Virgin. ed. 2, 136. 1762, *descr.*). Pennsylvania (Lancaster) = *O. spectabilis* Linn. (*Galearis spectabilis* Raf., 1833, *Galeorchis spectabilis* Rydb., 1901).

We merely record the fact that if one wishes to segregate a genus from *Orchis* as Rydberg did in 1901, *Galeorchis* Rydb. (1901) is antedated by *Galearis* Raf. (1833) by 68 years.

Orchis ***quinquefida** Muhl., Cat. 80. 1813; ed. 2, 1818, *nom. nud.* Carolina.

Possibly the same as *Habenaria quinqueseta* (Michx.) Sw.

Oryzopsis ***aspera** Muhl., Cat. 11. 1813; ed. 2, 10. 1818, *nom.* ut syn. *O. melanocarpa* Muhl. Pennsylvania. Ut videtur sphalm. = *O. asperifolia* Michx. (1803).

Oryzopsis **†melanocarpa** Muhl., Cat. 11. cc., *nom. nud.*; Descr. Gram. 79. 1817, *descr.* Pennsylvania = *O. racemosa* (J. E. Sm.) Ricker; see Hitchcock in Bartonia **14**: 34. 1932.

Panicum **†acuminatum** sensu Muhl., Descr. Gram. 125. 1817, *descr.*; Cat. ed. 2, 9. 1818, *nom.*: non Sw. (1788). [North America] = *P. xalapense* H. B. K. (1815); see Hitchcock in Bartonia **14**: 41. 1932.

Panicum ***agrostoides** Muhl. in Trans. Am. Philos. Soc. **4**: 236. 1799, *nom. nud.*; Mulh. ex. Barton, Fl. Phila. Prodr. 20. 1815, *descr.*; Spreng., Pugill. **2**: 4. 1815, *descr.*; Muhl., Descr. Gram. 119. 1817, *descr.* Pennsylvania (Lancaster), and, ex Descr. Gram., Georgia, Carolina, and Cherokee (Northern Georgia) = *P. agrostoides* Spreng. (1815); see Hitchcock, op. cit. 40.

This was apparently Muhlenberg's original name, published by Sprengel as his own species. No authority is indicated in the Muhlenberg description of 1817. A valid widely distributed species.

Panicum **†depauperatum** Muhl., Cat. 9. 1813; ed. 2, 8. 1818, *nom. nud.*; Descr. Gram. 112. 1817, *descr.* Pennsylvania, Carolina.

A valid species of wide distribution; see Hitchcock, op. cit. 39.

Panicum **†divergens** Muhl., Cat. 1. cc., *nom. nud.*; Descr. Gram. 120. 1817, *descr.*; Muhl. ex Ell., Sketch **1**: 130. 1816, *descr.*; non H. B. K. (1815). Carolina = *Leptoloma cognatum* (Schult.) Chase (*Panicum cognatum* Schult.); see Hitchcock, op. cit. 40.

Panicum **†geniculatum** Muhl. in Trans. Am. Philos. Soc. **4**: 235. 1799, *nom. nud.*; Cat. 11. cc. *nom. nud.*; Descr. Gram. 123, 1817, *descr.* (*P. dichotomiflorum* Michx.); Muhl. ex Ell., Sketch **1**: 117. 1816, *descr.*; non Lam. (1798). Pennsylvania, Carolina, Georgia = *P. dichotomiflorum* Mich. (1803); see Hitchcock, 1. c.

Panicum **†hispidum** Muhl., Cat. 9. 1813; ed. 2, 8. 1818, *nom. nud.*; Descr. Gram. 107. 1817, *descr.;* non Forst. (1786). New York, Delaware, Carolina = *Echinochloa walteri* (Pursh) Heller (*Panicum walteri* Pursh); see Hitchcock, op. cit. 38.

Panicum *pilosum Muhl. in Trans. Am. Philos. Soc. **4**: 236. 1799, *nom. nud.* Pennsylvania (Lancaster).

Panicum †rostratum Muhl., op. cit. **4**: 236. 1799, *nom. nud.*; Willd., Enum. Hort. Berol. 1032. 1809, *descr.*; Muhl., Cat. 9. 1813; ed. 2, 8. 1818, *nom.* (*P. anceps* Michx.); Descr. Gram. 121. 1817, *descr.* Pennsylvania, Virginia, Carolina, Cherokee (Northern Georgia) = *P. anceps* Michx. (1803); see Hitchcock, op. cit. 40.

Panicum †setaceum Muhl., Cat. 9. 1813; ed. 2, 8. 1818, *nom. nud.*; Descr. Gram. 99. 1817, *descr.* Georgia = *P. aciculare* Desv. (1816); see Hitchcock, op. cit. 37.

Parietaria *americana Muhl., Cat. 95. 1813; ed. 2, 100. 1818, *nom. nud.* Pennsylvania Cherok[ee] (Northern Georgia).

Paspalum †mucronatum Muhl., Cat. 11. cc., *nom. nud.*; Descr. Gram. 96. 1817, *descr.* (*P. paniculatum* Walt.); Ell., Sketch **1**: 109. 1816, *nom.* in syn. sub *Ceresia fluitans* Ell. Georgia, Mississippi = *P. repens* Berg. (1762); see Hitchcock, l. c.

Pastinaca *noxia Muhl., Cat. 31. 1813; ed. 2, 31. 1818, *nom. nud.* New York, Pennsylvania.

By this name Muhlenberg clearly intended to designate the wild form of the common parsnip, *Pastinaca sativa* Linn.

Pedicularis *verna Muhl. Cat. 58. 1813, ed. 2, 60. 1818, *nom.* ut syn. *P. canadensis* Linn. New England, Pennsylvania, Virginia = *P. canadensis* Linn.

Phacelia *parviflora Muhl., Cat. 20. 1813; ed. 2, 19. 1818, *nom.* (*Polemonium dubium* Linn.); Pursh, Fl. Am. Sept. **1**: 140. 1814, *descr.* Pennsylvania = *Phacelia dubia* (Linn.) Small.

Apparently here Pursh appropriated Muhlenberg's specific name; see p. 27.

Phalangium †ossifragum Muhl., Cat. 35. 1813; ed. 2, 35. 1818, *nom. nud.*; Steud., Nomencl. ed. 2, **2**: 184, 314. 1841, *nom.* New Jersey = *Narthecium americanum* Ker-Gawl. fide Torrey, Fl. U. S. **1**: 347. 1824 (*Abama americana* Morong).

Phaseolus *perennis Muhl. in Trans. Am. Philos. Soc. **3**: 175. 1793, *nom. nud.* Pennsylvania (Lancaster).

The only reason for listing this is that it is indicated as a new species, probably through oversight. Apparently Muhlenberg intended to record *P. perennis* Walt. (1788), which occurs in the region = *P. polystachyus* (Linn.) Britton, Sterns, & Poggenb.

Philadelphus *villosus Muhl., Cat. 48. 1813; ed. 2, 49. 1818, *nom. nud.* Tennessee Prob. = *P. grandiflorus* Willd. (1809).

Phlox *aspera Muhl., Cat. 21. 1813; ed. 2, 20. 1818, *nom. nud.* Cherokee (Northern Georgia).

Phyllanthus *distichus Muhl., Cat. 84. 1813; ed. 2, 88. 1818, *nom. alt. P. obovatus* Muhl. [ex Willd., Sp. Pl. **4**: 574. 1805]. Pennsylvania, Carolina, Georgia = *P. caroliniensis* Walt. (1788).

Pinus *denticulata Muhl., Cat. 89. 1813; ed. 2, 94. 1818, *nom. alt. P. nigra* Ait. [*Abies denticulata* Michx.]; Steud., Nomencl. ed. 2, **2**: 337. 1841, *nom.* New England, Pennsylvania = *Picea mariana* (Mill.) Britton, Sterns, & Poggenb.

Plantago †linearifolia Muhl., Cat. ed. 2, 15. 1818, *nom. nud.*; Torr., Fl. U. S. **1**: 185. 1824, *nom.* in syn. Pennsylvania, Carolina = *P. elongata* Pursh (1814).

Poa †brevifolia Muhl., Cat. 11. 1813; ed. 2, 10, 1818, *nom. nud.*; Descr. Gram. 138. 1817, *descr.*; non DC. (1804). Pennsylvania = *P. cuspidata* Nutt. (1818); see Hitchcock in Bartonia **14**: 42. 1932.

Poa *crocea Muhl., Cat. 11. 1818, *nom. alt. P. palustris* Linn. (*Poa crocata* Michx.). New England, New York = *P. palustris* Linn.

Poa †flexuosa Muhl. Cat., 11. cc., *nom. nud.*; Descr. Gram. 148. 1817, *descr.* Virginia, Carolina, Cherokee (Northern Georgia) = *P. autumnalis* Muhl. ex Ell., Sketch **1**: 159. 1816; see Hitchcock, op. cit. 44.

Poa *nutans Muhl. in Trans. Am. Philos. Soc. **3**: 161. 1793, *nom. nud.* Pennsylvania (Lancaster).

We suspect that this is the same as the species described by Sprengel as *Festuca nutans* Spreng., Mant. Fl. Hal. 34. 1807, non Moench (1794), which was based on a Muhlenberg specimen = *Festuca obtusa* Spreng. 1. c.; see Hitchcock, op. cit. 46.

Poa †obtusa Muhl., Cat. 11. cc., *nom. nud.*; Descr. Gram. 147. 1817, *descr.* New England, New Jersey, Pennsylvania = *Festuca obtusa* Spreng. (1807); see Hitchcock, 1. c.

This was doubtless originally a Muhlenberg name, for Sprengel's species was based on a specimen sent by the former. It is one of the very few species described in the "Descriptio" where the binomial is followed by the word "mihi", indicating that it was Muhlenberg's name.

Poa †refracta Muhl., Cat. 12, 1813; ed. 2. 11, 1818, *nom.* (*P. amabilis* Walt.); Descr. Gram. 146. 1817, *descr.*; Muhl. ex Ell., Sketch **1**: 162. 1816, *descr.* Carolina = *Eragrostis refracta* (Muhl.) Scribn.; see Hitchcock, op. cit. 43.

Poa *repens Muhl. in Trans. Am. Philos. Soc. **3**: 161. 1793, *nom. nud.* Pennsylvania (Lancaster).

Poa *rubra Muhl., op. cit., **4**: 436. 1799, *nom. nud.* Pennsylvania (Lancaster).

Poa †uniflora Muhl., Cat. 11, 1813; ed. 2. 11. 1818, *nom. nud.*; Descr. Gram. 151. 1817, *descr* New England, New Jersey = *Muhlenbergia uniflora* (Muhl.) Fernald in Rhodora **29**: 10. 1927); see Hitchcock in Bartonia **14**: 44. 1932.

Poa *viridis Muhl., Cat. 11, 1813; ed. 2, 10. 1818, *nom. nud.*; Descr. Gram. 138. 1817, *descr.*; Muhl. ex Ell., Sketch **1**: 159. 1816, *descr.* Pennsylvania, Carolina, Cherok[ee] (Northern Georgia) = *P. viridis* Schreb. ex Pursh. Fl. Am. Sept. **1**: 79. 1814 = *P. pratensis* Linn.; see Hitchcock, op. cit. 42.

Probably Muhlenberg's specific name was originated by Schreber, to whom he sent specimens for identification.

Podalyria †bracteata Muhl., Cat. 42. 1813; ed. 2, 42. 1818, *nom. nud.* Carolina.

Podalyria *virginica Donn, Hort. Cantab. ed. 4, 94. 1807, *nom. nud.*; Muhl., Cat. 11. cc., *nom. nud.* Virginia.

Polygala *nana Muhl., Cat. 63. 1813; ed. 2, 66. 1818, *nom.* sub *P. viridescens* [sensu Walter *Polygala lutea* Linn. var. *nana* Michx., Fl. Bor. Am. **2**: 54. 1803] = *P. nana* DC., Prodr. **1**: 328. 1824. Carolina, Georgia.

Polygala †pubescens Muhl., Cat. 11. cc., *nom. nud.*; Muhl. ex Nutt., Gen. **2**: 87. 1818, *descr.*; Muhl. ex Ell., Sketch **2**: 180. 1822, *descr.*; non Mart. (1815). Georgia = *P. grandiflora* Walt. (1788) (*Asemeia grandiflora* Small).

Polygala *rosea Muhl., Cat. 11. cc., *nom.* sub *P. pubescens* Muhl. [*P. senega* Linn. var. *rosea* Michx. Fl. Bor. Am. **2**: 53. 1803]. Carolina, Georgia = praec.

Polygonum *album Muhl., Cat. 40. 1813; ed. 2, 40. 1818, *nom. nud.*; Muhl. ex Barton, Fl. Phila. Prodr. 47. 1815, *descr.* Pennsylvania.

Barton's validating description is very short: "alb. foliis lanceolatis, acutis flo. Septembri". This might be the same as *P. acre* H. B. K. or *P. hydropiperoides* Michx.

Pontederia †lancifolia Muhl., Cat. 34. 1813; ed. 2, 33. 1818, *nom. nud.*; Muhl. ex Ell., Sketch **1**: 382. 1817, *descr.* Carolina, Georgia = *P. lanceolata* Nutt. (1818) vel. *P. cordata* Linn.

Should Muhlenberg's species prove to be the same as the one described by Nuttall, then Elliott's validation of it in 1817 antedates Nuttall's description by one year.

Potamogeton *anceps Muhl., Cat. 18. 1813; ed. 2, 17. 1818, *nom. nud.* Pennsylvania.

Potamogeton *nervosum Muhl. in Trans. Am. Philos. Soc. **4**: 236. 1799, *nom. nud.* Pennsylvania (Lancaster).

This was indicated as a new species.

Prenanthes *pumila Muhl., Cat. ed. 2, 72. 1818, *nom. nud.* Georgia = *Lygodesmia aphylla* (Nutt.) DC.

This is doubtless the same as *P. pumila* Baldw. ex Ell., Sketch **2**: 262. 1822. This name appears in Elliott's text as follows: "The specimen of this plant [*Prenanthes aphylla* Nutt.] which Dr. Baldwin sent me from St. Mary's under the name of Prenanthes pumila, is too imperfect to enable me to speak of it with much confidence. It appears to me questionable, however, whether it belongs to this genus. It grows in the pine barrens round St. Mary's, Georgia." Muhlenberg had a set of Baldwin's specimens.

Prinos †laevigatus Muhl., Cat. 36. 1813; ed. 2, 36. 1818 (*Prinus*), *nom. nud.*; Pursh, Fl. Am. Sept. **1**: 220. 1814, *descr.* New England, et fide Pursh, New York, Virginia = *Ilex laevigata* (Pursh) A. Gray.

Here Pursh may have appropriated Muhlenberg's specific name; see p. 27.

Prunus *depressa Donn, Hort. Cantab. ed. 4, 114, 1807, *nom. nud.*; Muhl., Cat. 48. 1813, ed. 2, 49. 1818, *nom. nud.* Pennsylvania. Prob. = *P. depressa* Pursh, Fl. Am. Sept. **2**: 332. 1814, "Canada to Virginia" = *P. pumila* Linn.

Pursh may or may not have taken the specific name from Donn.

Prunus *pubescens Muhl., Cat. 11. cc., *nom. nud.* Carolina.

Psoralea *hedysaroides Muhl., Cat. 67. 1813; ed. 2, 70. 1818, *nom. nud.*; Muhl. ex Nutt. Gen. **2**: 104. 1818, *nom.* in syn. Cherokee (Northern Georgia) = ? *P. onobrychis* Nutt. (*Orbexylum onobrychis* Rydb.)

Psoralea *obovata Muhl., Cat. 11. cc., *nom. nud.* Georgia.

Pulmonaria *mollis Donn, Hort. Cantab. ed. 4, 34. 1807, *nom. nud.*; Muhl., Cat. 19. 1813; ed. 2, 18. 1818, *nom. nud.* North America.

Pyrus *oligocarpa Muhl., Cat. 49. 1813, ed. 2, 50. 1818, *nom.* ("oligocarpa nana Donn *") [North America].

We find no *Pyrus* "*oligocarpa nana*" in any of the editions of Donn's Hortus Cantabrigiensis.

Quercus †castanea Muhl. in Trans. Am. Philos. Soc. **4**: 237. 1799, *nom. nud.*, Neue Schr. Ges. Naturf. Freunde Berlin **3**: 396. 1801, *descr.*; non Nee (1801). Pennsylvania = *Q. muhlenbergii* Engelm.

Quercus †filiformis Muhl., Cat. 87. 1813; ed. 2, 91. 1818, *nom. nud.*; A. DC. in DC., Prodr. **16**(2): 21. 1864, *nom.* in syn. Pennsylvania = *Q. bicolor* Willd. (1801).

Quercus *monticola Muhl., Cat. 11. cc., *nom. nud.* Pennsylvania, Georgia = *Q. montana* Willd., fide Torr., Cat. Pl. N. Y. 75. 1819 = *Q. prinus* Linn.

Ranunculus †fascicularis Muhl., Cat. 54. 1813; ed. 2, 56. 1818, *nom. nud.*; Bigel., Fl. Bost. 137. 1814, *descr.*; Muhl. ex Barton, Fl. Phila. Prodr. 60. 1815, *descr.* Pennsylvania, Massachusetts (Bigelow).

A valid species extending from New England and Ontario to Kansas, Georgia, and Texas.

Ranunculus †hirtus Muhl., Cat. 11. cc., *nom.* (*R. hispidus* Michx.); Steud., Nomencl. ed. 2, **2**: 433. 1841, *nom.* Pennsylvania, Virginia = *R. hispidus* Michx. (1803).

Ranunculus †nitidus Muhl., Cat. 11. cc., *nom. nud.*; Muhl. ex Ell., Sketch **2**: 60. 1821, *descr.* Carolina = *R. repens* Linn., fide Torr. & Gray, Fl. N. Am. **1**: 21. 1838.

In describing this species Elliott states: "This plant, the R. nitidus of Muhlenberg's Catalogue, but not of Walter [1788] is nearly allied to the *R. repens* [Linn] ...". Eaton described it in all editions of his Manual (1817 to 1840); see Merrill and Reeder in Bartonia **24**: 70. 1947.

Ranunculus †saniculaeformis Muhl., Cat. 11. cc., *nom. nud.*; Eaton, Man. ed. 2, 397. 1818, *descr.*; DC., Prodr. **1**: 40. 1824, *nom.* in syn. New England, New York, Delaware = *R. recurvatus* Poir. (1804).

Rhamnus *pubescens Muhl., Cat. 25. 1813; ed. 2, 24. 1818, *nom. nud.* No locality indicated. Prob. = *R. lanceolatus* Pursh (1814).

Rhododendron †catabiense Muhl., Cat. 43. 1813; ed. 2, 43. 1818, *nom. nud.*, sphalm = *R. catawbiense* Michx. Carolina.

Ribes *atropurpureum Lewis ex Muhl., Cat. 25. 1813; ed. 2, 25. 1818, *nom. nud.* Missouri. Prob. = *R. aureum* Pursh (1814).

In Muhlenberg's unpublished manuscript, Obs. Bot. Fl. Am. Sept. **1**: 20 he says: "The deep purple currant found on the Missouri near the Aricara Nation", i. e., material from the Lewis and Clark expedition.

Ribes *coccinem Lewis ex Muhl., Cat. 11. cc., *nom. nud.* Jefferson River (Montana).

Perhaps this is the same as *R. sanguineum* Pursh (1814), but Pursh's specimen was from the Columbia River. In Muhlenberg's unpublished manuscript this is indicated as "the scarlet currant of the River Jefferson."

Ribes *spinosissimum Muhl., Cat. 26, 1813; ed. 2, 25. 1818, *nom. nud.* Pennsylvania "H". i. e., hort. (cultivated).

In Muhlenberg's unpublished manuscript this is indicated as "the deep purple gooseberry of River Jefferson." These *Ribes* species were described by Muhlenberg (MS) from plants grown by Mr. McMahon in Philadelphia, the seeds from the Lewis and Clark expedition. *R. spinosissimum* flowered in Philadelphia, March 26, 1811.

Rosa †cherokeensis Donn, Hort. Cantab. ed. 5, 128. 1809, *nom. nud.*; Muhl., Cat. 50. 1813; ed. 2, 51. 1818, *nom. nud.* North America.

What Donn presumably had was the species popularly known as the Cherokee rose = *Rosa laevigata* Michx. (1803).

Rosa †serotina Donn, 1. c., *nom. nud.*; Muhl. 11. cc., *nom. nud.*; Donn ex Thory, Prodr. Monog. Rosier 142. 1820, *nom. nud.* North America.

Rosa *stricta Donn, 1. c., *nom. nud.*; Muhl. 11. cc., *Nom. nud.* North America.

Muhlenberg credits the species to Donn; the entry in Index Kewensis is *Rosa stricta* Muhl. The form described and illustrated as *Rosa stricta* Muhl. by Lindley, Rosa. Monog. 42. *pl.* 7. 1820, is apparently a form of *R. nitida* Willd.

Rubus *purpureus Muhl., Cat. 50. 1813; ed. 2, 52. 1818, *nom. alt. R. flagellaris* Willd. = *R. canadensis* Linn.

Rudbeckia *lobata Donn, Hort. Cantab. ed. 4, 196. 1807, *nom. nud.*; Muhl., Cat. 78. 1813; ed. 2, 82. 1818, *nom. nud.* North America. Prob. = *R. trilobata* Linn.

Rumex *hastatulus Baldw. ex Ell., Sketch **1**: 416. 1817, *descr.*; Muhl., Cat. ed. 2, 37. 1818, *nom.* (Ind. Kew ut "hastulatus Baldw."). Georgia.

A valid species. New England to Illinois southward to Florida and Texas.

Sagittaria *graminifolia Muhl., Cat. 86. 1813; ed. 2, 91. 1818, *nom. nud.* Pennsylvania Carolina. Prob. = *S. graminea* Michx. (1803).

Sagittaria *heterophylla Muhl., Cat. 11. cc., *nom. nud.*; Pursh, Fl. Am. Sept. **2**: 396. 1814, *descr.* Pennsylvania = *S. heterophylla* Pursh (1814).

Pursh apparently appropriated Muhlenberg's specific name; see p. 27.

Salix †prostrata Muhl., Cat. 91. 1813; ed. 2, 95. 1818, *nom. nud.* New England.

Salix †washitana Muhl., Cat. 11. cc. *nom. nud.*; Raf., Fl. Ludovic. 138. 1817, *nom. nud.* Washita (Arkansas or Oklahoma).

Sambucus *atropurpurea Muhl., Cat. 33. 1813; ed. 2, 23. 1818, *nom. nud.* Pennsylvania, Virginia, Carolina. Prob. = *S. pubens* Michx. (1803).

Santolina *pinnatifida Muhl., Cat. ed. 2, 75. 1818, *nom. nud.* Louisiana, Pennsylvania (cult.). Prob. = *S. chamaecyparissus* Linn.

Scandix †dulcis Muhl., Cat. 31. 1813; ed. 2, 31. 1818, *nom.* (*Myrrhis* [*claytoni*] Michx.); Pursh, Fl. Am. Sept. **1**: 196. 1814, *nom.* in syn. New York, Pennsylvania = *Osmorhiza claytoni* (Michx.) C. B. Clarke.

Schoenus †fuscus Muhl., Cat. 11. cc., *nom. nud.*; Descr. Gram. 6. 1817, *descr.* New York = *Rhynchospora grayii* Kunth; see Gale in Rhodora **46**: 230. 1944.

Schoenus *lithospermus Muhl. in Trans. Am. Philos. Soc. **3**: 160. 1793, *nom. nud.* Pennsylvania (Lancaster) = *Scleria* sp.

This is indicated as a new species. It has nothing to do with *Schoenus lithospermus* Linn., Sp. Pl. ed. 2, 65. 1763, which was based on *Scirpus lithospermus* Linn., Sp. Pl. 51. 1753, a species of British India.

Schoenus †mariscoides Muhl., Cat. 5. 1813; ed. 2, 5. 1818, *nom. nud.*; Descr. Gram. 4. 1817, *descr.* Pennsylvania = *Cladium mariscoides* (Muhl.) Torr. (*Mariscus mariscoides* O. Kuntze).

Schoenus †setaceus Muhl., Cat. 6. 1813; ed. 2, 5. 1818, *nom. nud.*; Descr. Gram. 6. 1817, *descr.* Pennsylvania = *Rhynchospora capillacea* Torr.; see Gale in Rhodora **46**: 126. 1944.

Scirpus †acuminatus Muhl., Cat. 6. 1813; ed. 2, 6. 1818, *nom. nud.*; Descr. Gram. 27. 1817, *descr.* No locality indicated = *Eleocharis acuminata* Nees = ? *E. compressa* Sull. (1842); see Svenson in Rhodora **34**: 216. 1932.

There is no specimen in Muhlenberg's herbarium fide Torrey and Svenson.

Scirpus †acutus Muhl., Cat. 7, 1813; ed. 2, 6. 1818, *nom. nud.*; Descr. Gram. 33. 1817. *descr.*; Muhl. ex Bigel., Fl. Bost. 15. 1814, *descr.*; Muhl. ex Barton, Fl. Phila. Prodr. 18. 1815, *descr.* New England, Pennsylvania.

Often reduced to *Scirpus lacustris* Linn., but now considered to represent a distinct species, for which Muhlenberg's name is used. Newfoundland to Alaska southward to Texas and Arizona.

Scirpus †brunneus Muhl., Cat. 7, 1813; ed. 2, 7. 1818, *nom. nud.*; Descr. Gram. 42. 1817, *descr.*; Muhl. ex Ell., Sketch **1**: 87. 1816, *nom.* in syn. New Jersey, Pennsylvania, Delaware = *S. exaltatus* Pursh (1814) = *S. polyphyllus* Vahl (1806).

Scirpus †cyperiformis Muhl., Cat. 7. 1813; ed. 2, 7. 1818, *nom.* (*S. lupulinus* Spreng.); Descr. Gram. 41. 1817, *descr.* (*S. lupulinus* Spreng.). New England, Pennsylvania, Carolina, Georgia, Cherokee (Northern Georgia) = *Cyperus filiculmis* Vahl var. *macilentus* Fernald.

Scirpus *debilis Muhl., Cat. 7. 1813; ed. 2, 6. 1818, *nom. nud.*; Descr. Gram. 34. 1817, *descr.*; Muhl. ex Ell., Sketch **1**: 79. 1816, *descr.* Pennsylvania, Carolina = *S. debilis* Pursh, Fl. Am. Sept. **1**: 55. 1814.

Apparently here Pursh appropriated a Muhlenberg binomial as his own; see p. 27.

Scirpus †intermedius Muhl., Cat. 11. cc., *nom. nud.*; Descr. Gram. 31. 1817, *descr.* Pennsylvania = *Eleocharis intermedia* (Muhl.) Schult. (*E. reclinata* Kunth, 1837).

A species extending from Quebec and northern Maine to Minnesota south to Tennessee, Pennsylvania, and New Jersey. See Svenson in Rhodora **39**: 262. 1937; **41**: 67. 1939.

Scirpus *maculatus Muhl., Cat. 7. 1813; ed. 2, 6. 1818, *nom. alt. S. acutus* Muhl. Pennsylvania = *S. acutus* Muhl.

Scirpus *monanthos Muhl., Cat. 7. 1813; ed. 2, 6. 1818, *nom. nud.* Delaware.

From the specific name we suspect that some representative of the genus *Eleocharis* R. Br. is indicated.

Scirpus †pendulus Muhl., Cat. 7. 1813; ed. 2. 7. 1818, *nom. nud.*; Descr. Gram. 44. 1817, *descr.*; Muhl. ex Ell., Sketch **1**: 87. 1816, *nom.* ut syn. *S. lineatus* Michx. Pennsylvania, Carolina, Cherokee (Northern Georgia) = *S. lineatus* Michx. (1803).

Scirpus †planifolius Muhl., Cat. 7. 1813; ed. 2, 6. 1818, *nom. nud.*; Descr. Gram. 32. 1817, *descr.*; Muhl. ex Barton, Fl. Phila. Prodr. 17. 1815, *descr.*; non Grimm (1767). Pennsylvania, Delaware = *S. verecundus* Fernald in Rhodora **50**: 284. 1948.

A valid species known from New England to Pennsylvania, Delaware, and Missouri, but unfortunately Muhlenberg's specific name was preoccupied whence the new name published by Fernald in 1948.

Scirpus †subsquarrosus Muhl., Cat. 11. cc. *nom. nud.*; Descr. Gram. 39. 1817, *descr.* Pennsylvania, Georgia = *Isolepis subsquarrosa* (Muhl.) Schrad. ex Schult. in Roem & Schult., Syst. Veg. Mant. **2**: 64. 1824 = *Hemicarpha micrantha* (Vahl) Pax.

Scirpus †trichodes Muhl., Cat. 7. 1813; ed. 2, 6. 1818, *nom. nud.*; Descr. Gram. 30. 1817, *descr.* (*S. capillaceus* Michx, *S. pusillus* Vahl); Muhl. ex Barton, Fl. Phila. Prodr. 17. 1815, *descr.*; Muhl. ex Ell., Sketch **1**: 76. 1816, *descr.* Pennsylvania, and fide Elliott, South Carolina (Charleston) = *Eleocharis acicularis* (Linn.) R. Br.

Scleria *reticulata Muhl., Descr. Gram. 266. 1817, *nom.* in syn., sphalm.; Ell., Sketch **2**: 560. 1823, *descr.*, sphalm. Carolina = *S. reticularis* Michx. (1803).

Eaton, Man. ed. 5, 486. 1829, also used the form *Scleria reticulata*, perhaps copying from Muhlenberg; see Merrill and Reeder in Bartonia **24**: 72. 1947.

Scutellaria †cordifolia Muhl., Cat. 56. 1813; ed. 2, 59. 1818, *nom. nud.*; Eaton, Man. ed. 2, 433. 1818, *descr.*; Muhl. ex Nutt., Gen. **2**: 38. 1818, *nom.* ut syn. *S. versicolor* Nutt.; Muhl. ex Ell., Sketch **2**: 91. 1821, *descr.*; Benth. in DC., Prodr. **12**: 422. 1848, *nom.* in syn. Carolina, Mississippi, cultivated in Pennsylvania = *S. ovata* Hill, Hort. Kew. ed. 2, 242. *pl. 8.* 1768 (*S. versicolor* Nutt., 1818).

See Blake in Rhodora **17**: 133. 1915. Fernald, op. cit. **44**: 432. 1942, places *S. versicola* Nutt. as a variety of *S. ovata* Hill. Eaton first validated *S. cordifolia* Muhl.; see Merrill & Reeder, in Bartonia **24**: 72. 1947.

Scutellaria *parviflora Muhl., Cat. 56. 1813; ed. 2, 58. 1818, *nom. nud.* Pennsylvania, Kentucky, Illinois.

Senecio *hirsutus Muhl., Cat. 73. 1813; ed. 2, 76. 1818, *nom. nud.* New Jersey.

Senecio *pusillus Muhl., Cat. 73. 1813; ed. 2, 77. 1818, *nom. nud.* New Jersey.

Senecio *spatulatus Muhl., Cat. 11. cc., *nom. nud.* Pennsylvania.

Sesbania †macrocarpa Muhl., Cat. 65. 1813; ed. 2, 68. 1818, *nom. nud.*; Raf., Fl. Ludovic, 137. 1817, *nom. nud.*; Muhl. ex Ell., Sketch **2**: 221. 1822, *descr.* Carolina, Mississippi = *S. emerus* (Aubl.) Urb. in Repert. Sp. Nov. **16**: 149. 1919.

This is Small's disposition of Muhlenberg's species, Man. Southeast. Fl. 702. 1933, as *Sesban *emerus* (Aubl.) Britton & Wilson, Sci. Surv. Porto Rico **5**: 395. 1924. *Sesban *sericea* Britton & Wilson l. c. is another unlisted binomial.

Silene †alba Muhl., Cat. 45. 1813; ed. 2, 45. 1818, *nom. nud.*; Rohrbach, Monog. Silene 87. 1868, *nom.* in syn. Pennsylvania = *S. nivea* (Nutt.) Otth in DC., Prodr. **1**: 377. 1824 (*Cucubalus niveus* Nutt., 1818).

This case is discussed by Merrill and Reeder in Bartonia **24**: 57. 1947, sub *Cucubalus nivens* Eaton.

Silphium *cordifolium Muhl. Cat. 79. 1813; ed. 2, 83. 1818, *nom. nud.* North America.

Silphium *varians Donn, Hort. Cantab. ed. 4, 198. 1807, *nom. nud.*; Muhl, Cat. ll. cc., *nom. nud.* North America.

Sium †tenuifolium Muhl., Cat. 31. 1813; ed. 2, 30. 1818, *nom. nud.*; Muhl. ex Barton, Fl. Phila. Prodr. 37. 1815, *descr.* Pennsylvania = *S. suave* Walt. (1788).

Solanum *exasperatum Muhl., Cat. 24. 1813; ed. 2, 23. 1818, *nom.* ut syn. *S. nigrum* Linn.; Muhl. ex Barton, Fl. Phila. Prodr. 32. 1815, *nom.* in syn. Pennsylvania = *S. nigrum* Linn.

Solidago †scabra Muhl., Cat. 76. 1813; ed. 2, 79. 1818, *nom. nud.*; Torr. & Gray, Fl. N. Am. **2**: 224. 1841, *nom.* in syn. Pennsylvania = *S. canadensis* Linn. var. *scabra* A. Gray = *S. altissima* Linn.

Solidago †squarrosa Muhl., Cat. ll. cc., *nom. nud.*; Nutt., Gen. **2**: 161. 1818, *descr.*; Muhl. ex Ell., Sketch **2**: 388. 1822, *descr.* New York, Pennsylvania, Georgia.

A valid species, New Brunswick and Ontario southward to North Carolina and presumably Georgia. Nuttall in providing the first description did not credit the binomial to Muhlenberg, but stated: "According to Muhlenberg's Catalogue, it exists also in Pennsylvania and Georgia."

Spartina †glabra Muhl., Cat. 8. 1813; ed. 2. 7. 1818, *nom. nud.*; Descr. Gram. 54, 1817, *descr.*; Muhl. ex Bigel., Fl. Bost. 17. 1814, *descr.*; Muhl. ex Ell., Sketch **1**: 95. 1816, *descr.* New England, New York, Delaware, Carolina = *S. alterniflora* Loisel. (1807).

Spiraea *corymbosa Muhl., Cat. 49. 1813, ed. 2, 51. 1818, *nom.* (*S. carpinifolia* Willd.). Pennsylvania = *S. corymbosa* Raf. (1814), fide Torrey, Fl. U. S. **1**: 482. 1824.

We suspect that this was a case where Muhlenberg originated the binomial and that Rafinesque appropriated it as his own.

Stipa †melanocarpa Muhl., Cat. 13. 1813; ed. 2, 12. 1818, *nom. nud.*; Descr. Gram. 183. 1817, *descr.*; Muhl. ex Ell., Sketch **1**: 146. 1816, *nom.* in syn. Georgia = *Heteropogon melanocarpus* (Ell.) Benth. (*Andropogon melanocarpus* Ell., 1816); see Hitchcock in Bartonia **14**: 48. 1932.

Symplocos *montana Muhl. Cat., 67. 1813; ed. 2, 70. 1818, *nom. nud.* No locality indicated = *S. tinctoria* (Linn.) L'Hérit.

Taxus *diffusa Muhl., Cat. 93. 1813; ed. 2, 98. 1818, *nom.* ut syn. *T. canadensis* Willd. New England, Pennsylvania = *T. canadensis* Marsh. (1785).

Thalia *caerulea Muhl., Cat. 1. 1813; ed. 2, 1. 1818, *nom. nud.* Carolina = *T. dealbata* Fraser (1794).

Thalictrum †palmatum Walt. ex Muhl., Cat. 54. 1813; ed. 2, 56. 1818, *nom. nud.*; Spreng., Syst. **2**: 674. 1825, *descr.* (*T. ranunculinum* Muhl. ex Willd., Enum. Hort. Berol. 585. 1809, *descr.*). Carolina = *Trautvetteria carolinensis* (Walt.) Vail.

We cannot explain Muhlenberg's use of Walter's name as an authority for this species, as he published only one species of *Thalictrum*, *T. carolinianum* Walt., Fl. Carol. 157. 1788.

Thymbra *walteri Muhl., Cat. 56. 1813; ed. 258. 1818, *nom. nud.* Georgia. Prob. = *Macbridea caroliniana* (Walt.) Blake in Rhodora **17**: 132. 1915 (*M. pulchra* Ell.).

Tilia *argentea Muhl., Cat. 52. 1813; ed. 2, 54. 1818, *nom. nud.* Carolina. Prob. = *T. heterophylla* Vent.

Trichodium †scabrum Muhl., Cat. 10. 1813; ed. 2, 10. 1818, *nom.* (*Agrostis scabra* Willd.); Descr. Gram. 61. 1817, *descr.* Pennsylvania, Virginia = *Agrostis hiemalis* (Walt.) Britton, Sterns, & Poggenb.; see Hitchcock in Bartonia **14**: 30. 1932.

Trifolium †stoloniferum Muhl., Cat. 67. 1813; ed. 2, 70. 1818, *nom. nud.*; Eaton, Man. ed. 2, 468. 1818, *descr.* Ohio, Kentucky, Pennsylvania.

A valid species, the first description actually published for Muhlenberg by Eaton. We interpret the "C" following Muhlenberg's Pennsylvania record to signify that he had the species in cultivation in Lancaster, although the species actually occurs in Pennsylvania. See Merrill and Reeder in Bartonia **24**: 76. 1947.

Ulmus *aspera Muhl., Cat. 29. 1813; ed. 2, 28. 1818, *nom.* (*U. fulva* Michx.). Pennsylvania, Virginia, Carolina, Tennessee = seq.

Ulmus *rubra Muhl. in Trans. Am. Philos. Soc. **3**: 165. 1793, *nom.* (*U. americana* Marshall, non Linn.). Pennsylvania (Lancaster) (*Ulmus fulva* Michx., 1803).

This case is discussed by Fernald in Rhodora **47**: 203. 1945. The record is clear, and Muhlenberg's long overlooked but validly published name replaces the long used *U. fulva* Michx.

Vaccinium *cespitosum Michx., Fl. Bor. Am. **1**: 234. 1803, *descr.*; Muhl. Cat. 39. 1813, ed. 2, 39. 1818, *nom.* Canada = *V. caespitosum* Michx. (1803).

Michaux actually published this as *cespitosum*, but the form accepted by most authors is *caespitosum* and the entry in Index Kewensis is the latter.

Verbena *phrynoides Muhl., Cat. 57. 1813; ed. 2, 59. 1818, *nom. nud.* Carolina.

Viburnum *arboreum Bartr. ex Muhl., Cat. 32. 1813; ed. 2, 32. 1818, *nom.* (*V. pyrifolium* Poir.). New Jersey, Pennsylvania = *V. prunifolium* Linn.

Viburnum *longifolium Muhl., Cat. 11. cc., *nom. nud.* No locality indicated. An *V. longifolium* Raf., Alsogr. Am. 56. 1836?

Rafinesque's species perhaps represents *Viburnum lentago* Linn. The form that Muhlenberg named, but which he did not describe, may or may not be the same.

Viburnum *ulmifolium Donn, Hort. Cantab. ed. 4, 62. 1807, *nom. nud.*; Muhl., Cat. 11. cc., *nom. nud.* North America.

Vicia †lutescens Muhl., Cat. 65. 1813; ed. 2, 68. 1818, *nom. nud.* Carolina.

This is the same as *Vicia acutifolia* Ell. (1822), on the authority of Le Conte cited by Torrey and Gray, Fl. N. Am. **1**: 272. 1838.

Viola †barbata Muhl., Cat. 26. 1813, ed. 2, 25. 1818, *nom.* (*V. sororia* Willd). Pennsylvania *V. sororia* Willd. (1809).

Viola *pygmaea Donn, Hort. Cantab. ed. 4, 49. 1807, *nom. nud.*; Muhl., Cat. 11. cc., *nom. nud.* North America.

Viola †uliginosa Muhl., Cat. 26. 1813; ed. 2, 25. 1818, *nom.* ut syn. *V. asarifolia* Schreb. Pennsylvania = *V. conspersa* Reichb. (1823) (*V. muhlenbergii* Torr., 1824).

Viola asarifolia Schreb. ex Muhl. (1793) is a *nomen nudum*.

Viola *variegata Donn, l. c. *nom. nud.*; Muhl., Cat. 11. cc., *nom. nud.* North America.

Virgilia *tinctoria Muhl., Cat. 42. 1813; ed. 2, 42. 1818, *nom.* (*V. lutea* Michx. f.). Tennessee = *Cladrastis *lutea* (Michx. f.) K. Koch, Dendr. **1**: 6. 1869; Raf. ex Jacks., Ind. Kew. **1**: 552. 1893.

Vitis *blandi Muhl., Cat. 27. 1813; ed. 2, 26. 1818, *nom. nud.* "Bland's grape" Cult. = *V. labrusca* Linn.

This is a much earlier use of the binomial than *Vitis *blandi* Prince, Treatise Vine 177. 1830, *nom.* sub *V. blanda* [Sweet]. The reduction of *Vitis blandi* Prince was made by L. H. Bailey in A. Gray, Syn. Fl. N. Am. **1**: 429. 1897; the form named by Muhlenberg is undoubtedly the same as that of Prince.

Vitis †intermedia Muhl., Cat. 11. cc., *nom.* (*V. aestivalis* Michx.). Pennsylvania, Virginia, Carolina = *V. aestivalis* Michx.

Vitis †labruscoides Muhl., Cat. 11. cc., *nom. nud.*; Raf., Med. Fl. **2**: 127. 1830, *descr.* Pennsylvania. Prob. = *V. labrusca* Linn.

This was apparently an original Muhlenberg name appropriated by Rafinesque; see p. 26.

Vitis †odoratissima Donn, Hort. Cantab. ed. 4, 50. 1807, *nom. nud.*; Muhl., Cat. 11. cc., *nom. nud.* Pennsylvania = *V. vulpina* Linn., fide L. H. Bailey, op. cit. 422.

Vitis *verrucosa Muhl., Cat. 11. cc., *nom.* (*V. rotundifolia* Michx.); Raf., Med. Fl. **2**: 133. 1830, *descr.* Virginia, Carolina, Georgia, Cher[okee] (Northern Georgia) = *V. rotundifolia* Michx. (1803).

This may have been an original Muhlenberg name appropriated by Rafinesque; see p. 26.

Yucca *recurvata Muhl., Cat. 36. 1813; ed. 2, 35. 1818, *nom. nud.* Georgia = *Y. recurvifolia* Salisb. (1806).

The Last Sickness of Rafinesque

FRANCIS W. PENNELL

When recounting some four years ago "How Durand acquired Rafinesque's Herbarium",[1] I referred in a footnote to the paper that is now being presented, which had then for some months been awaiting publication in Chronica Botanica.[2] A change in the kind of material handled by that journal (from short notes and articles to large studies and books) left this paper stranded; so, although it had already been marked for the printer, I have recalled it for presentation now in BARTONIA. So much interest has been taken in Rafinesque, as to make the prompt appearance of its information desirable.

When preparing my account of "The Life and Work of Rafinesque" in the autumn of 1940, I was able to trace from manuscripts on hand Rafinesque's activity up to May, 1840, and, since all the five parts of the "Autikon Botanikon" and also "The Good Book, and Amenities of Nature" appeared in that year, I surmised that "his complaint, cancer of the stomach and liver, did not become evident, or at least dominant, many months before his death." An unexpected light has come to confirm this, and also to show that Rafinesque was not so alone in his last months as has been supposed.

In my address of 1940 I told of the wealth of Rafinesque manuscripts and letters that had been presented to the Academy of Natural Sciences of Philadelphia by Dr. Samuel S. Haldeman in 1849, he having acquired Rafinesque's many papers. In recent years Dr. Haldeman's grandson, Mr. Guy K. Haldeman, has been giving us much from his grandfather's library, and in the winter of 1943-44 produced a most surprising document. This is a copy of the Medical Examiner for September 19, 1840,[3] the first article of which, under date of "October, 1840" and under the heading of "Transactions of the Pathological Society" is by Edward Hallowell, M.D., and treats of a "Case of Cancer of the Stomach and Liver." The patient was given as "C. F. Rafinesque Smaltz, aetat. fifty-seven," a name certainly intended for C. S. Rafinesque Schmaltz. It will be remembered that Rafinesque frequently appended his mother's family name to his own, after a usual custom of Latin countries.

---

[1] Bartonia **23**: 43-46, 1945, the reference being to footnote 3.

[2] In which had appeared late in 1940 a paper entitled "New Light on Rafinesque" (6: 125-126) that summarized the previously unrecorded material found at the Academy of Natural Sciences and elsewhere in Philadelphia which had contributed new information to my account of "The Life and Work of Rafinesque" that was delivered as a centennial address at Transylvania College on October 30, 1940 and which was subsequently printed in the Transylvania College Bulletin 25: 10-70, 1942.

[3] Medical Examiner. Devoted to Medicine, Surgery, and the Collateral Sciences, No. 38, Philadelphia, Saturday, September 19, 1840, Vol. III.

This paper, which was known to Haldeman but not to recent students of Rafinesque's career, says that he "had throughout life enjoyed almost uninterrupted health until the winter of 1839-40, when he was affected with constipation of the bowels, which continued until the end of the following spring. On the 15th of June he for the first time complained of nausea, with occasional vomiting and pain after eating animal food, which occurred a short time after its entrance into the stomach. Two weeks ago [evidently toward the end of August] he observed, for the first time, a tumor in the right hypochondriac region, when he also noticed a decided yellowness of the skin; since which he has complained much of debility, and for the last week has been confined almost entirely to his room."

From this point Dr. Hallowell commences his own detailed observations and prescriptions, with a record of the patient's condition day by day. This is introduced by the heading: "Present state, Sept. 10th, 1840, when I was requested to see him in consultation by my friend Dr. Ashmead." It is pertinent to note that both Dr. Ashmead and Dr. Hallowell were interested in natural history as well as in medicine,[4] a fact which must have made them acquainted with Rafinesque and the more acceptable to him.

Rafinesque died at 9 P.M., September 18th, and Dr. Hallowell's account proceeds: "The following notes of the autopsy were taken by myself and Dr. Ashmead, thirteen hours after death." The examination, after telling of the emaciated body, straw-colored skin, and greatly distended abdomen, deals in much anatomical detail with the condition of the head, the thorax, and the abdomen. The liver, especially, was greatly enlarged. One wonders that the symptoms were not evident earlier.

Dr. Hallowell's report is purely medical, and gives no information as to where or how Rafinesque was living, how sadly his resources were being depleted, what friends came to visit him, and many other things we should like to know. But it does show that he received whatever help medical care could bring him. Also, this explains why his body had been removed to another room, when Dr. Mease brought Mr. Bringhurst, the undertaker, to obtain it for burial.[5] And it shows that Dr. Mease only appeared as the executor of Rafinesque's estate, and not, as I had surmised, as likely the physician in his last illness.

[4] William Ashmead (1801-88), M.D., University of Pennsylvania, 1826, and Edward Hallowell (1809-60), M.D., Univ. Penn., 1830, were both members of the Academy of Natural Sciences as well as of the College of Physicians of Philadelphia. Dr. Hallowell was the author of papers in herpetology as well as in medicine, and his diaries and other manuscripts are preserved at the Academy.

[5] Thus seeming to refute the ugly rumour that was printed some thirty years after Rafinesque's death; see Transylv. Coll. Bull. 25: 63, 1942.

Notes on Various Flowering Plants

On the Occurrence of Franklinia in Cape May County, New Jersey.—The attention of field botanists should be called to the possibility of finding examples of *Franklinia* growing outside cultivation and under apparently natural conditions at sundry points in Cape May County. Early in the fall of 1946 the writer was surprised to find a cluster of several shoots in a dense thicket of shrubs on the side of an old gravel pit, now largely filled with water, a few hundred yards east of the railroad station at Palermo. One shoot was at least six feet tall and bore a single wide-opened flower and several swollen floral buds, as well as a small cluster of leaves. The same plants were seen and their identity confirmed a few days later by two other observers, the late Otway H. Brown, who took a sample for herbarium preservation, and Richard B. Chillas, Jr., who took several photographs of the plants *in situ*. However, the next day a chance meeting with the owner of the tract, W. M. Cameron of Ocean City, yielded the fortunate, even if disappointing, information that the plants in question had been set out some seven to eight years ago by the County Clerk, Stirling W. Cole, the original cuttings having come from two trees growing at his residence in Ocean City. Several weeks later, in a personal interview, Mr. Cole confirmed this fact and added the further information that he had attempted to establish the species at a few other points in the County, naming specifically Ocean View (old gravel stripping, now largely a cranberry plantation, on the south side of the highway to Sea Isle City and close to the salt meadow), Court House (low moist tract, partly wooded, a slight distance west of Route 4, opposite the County Farm), and a rather indefinite point on the gravel road between Court House and South Dennis, apparently along a stream a short distance south of Goshen Station. At this last station, according to Mr. Cole, the plants had either died out or were in poor condition, but those opposite the County Farm were in 1946 in good condition, although, owing to the dense shade, they had made little growth. At the Ocean View station he was uncertain of their fate, not having visited the spot since the plants were set out. The present writer plans to search for them at this latter station during the coming summer.*

HENRY FOX

OCEAN VIEW, N. J.

---

* Since the above was written, the plants at Palermo have been observed in bloom in both 1947 and 1948, but were apparently in poor condition; those at Court House were destroyed in 1948 when the ground was being cleared in preparation for the annual clam bake, held in the adjoining County Park; while efforts to find the plants at Ocean View have so far been fruitless. Additional cuttings put out in the spring of 1947 at several points at Ocean View and near South Seaville failed to survive the ensuing summer which was unusually hot and dry.

H. F., April 13, 1949.

Further observations on eastern Tiarellas.—In 1937 Miss Olga Lakela published a monograph of the genus *Tiarella*,[1] recognizing in the eastern states two species. Three years later the writer proposed a new variety (subspecies) of one of these.[2] A like period later Professor Fernald occupied 4 pages of Rhodora [3] with a discussion of the features of these entities.

In order to obtain information on data as to which there semed to be a difference of opinion, the writer visited the type locality of *T. wherryi* in September, 1946, and collected 5 plants for cultivation. These were planted in a wild garden at Swarthmore, Pennsylvania, close to a large clump from the type locality of *T. cordifolia collina* (mistakenly given as in Patrick County, Virginia, in the original description; actually Henry County). They survived the winter without injury, the leaves remaining fairly evergreen, and bloomed well in the spring of 1947.

As brought out in the illustrations already published, the leaves of the two are strikingly dissimilar. Those of *T. wherryi* are relatively narrow and deeply lobed, the major lobes acuminate, the lesser acute; they are, moreover, dull on the surface and brown-maculate. Those of *T. cordifolia collina* are relatively broad and shallow-lobed, the lobes acutish to obtusish; they are shining and non-maculate.

The latter entity came into bloom first, its flowers maturing and fading rapidly. The former opened its first flower only 5 days later, but flower-development and maturation was slower, the earliest inflorescences being still in bloom two weeks after those of the other entity; and in addition successive new flowering stalks continued to appear over a period of several weeks, continuing well into summer. Its lateness is then not due, as postulated by Professor Fernald, to its growing in a " relatively cool and backward area; " it is an inherent trait.

The average sizes of floral organs proved somewhat less in *T. wherryi* than in *T. cordifolia collina;* in particular, the capsule valves of the former are only about ⅔ as long as those of the latter. Their shape is essentially identical with that of *T. cordifolia austrina.*

Segregation of the entities involved here is, then, not artificial as held by Professor Fernald. Although there are evidently some intermediates between them, the entities described as *T. wherryi* and *T. cordifolia collina* are too dissimilar to justify merging in synonymy. A cytogeographic study of the series would be interesting.

EDGAR T. WHERRY

UNIVERSITY OF PENNSYLVANIA

---

[1] Amer. Journ. Bot. 24: 344, 1937.

[2] Notulae Naturae (Acad. Nat. Sci. Phila.) No. 42, 1940.

[3] Rhodora 45: 445, 1943.

Trillium pusillum in Maryland.—When proposing the varietal epithet *virginianum* for the dwarf *Trillium* of southeastern Virginia, Professor Fernald [1] cited specimens from that state only. Actually, this entity had previously been noted in Maryland, though under mistaken identification.

In their study of Pocomoke swamp, Beaven and Oosting [3] listed on pages 374 and 385 *Trillium sessile* among the plants observed. A specimen reached the herbarium of the Academy of Natural Sciences of Philadlephia and remained in the *T. sessile* cover until its real identity was recognized by Mr. Stanley Smith, who is monographing the genus.

The locality given, Carey's Creek, could not be found on any map, but Mr. Beaven in correspondence indicated its location, and on May 4, 1947, it was visited by Dr. R. R. Tatnall, Mr. G. R. Proctor, and the writer. It lies 2 miles east-northeast of Pocomoke City, Worcester County, Maryland, and is bordered by an extensive swamp. Near the margin of this there are many hummocks of humus with subacid to mediacid reaction (pH 6 to 5, active acidity 10 to 100). Conspicuous on these were flowering plants of *Anemone quinquefolia*, and after some search the *Trillium* was found on several of the hummocks. (It thus resembles the northern *T. undulatum* in soil preference.)

Its range is thus extended not only into a new state but also from the western to the eastern shore of the Chesapeake estuary.[3]

EDGAR T. WHERRY

UNIVERSITY OF PENNSYLVANIA

Postscript on eastern lilies.—In BARTONIA, No. 24: p. 7, several epithets which had been applied to variants of *Lilium philadelphicum* were assigned to the status of *forma*, one being omitted because its place of publication had not been ascertained at the time. Subsequently, through the kindness of Miss Marjorie W. Stone of the Gray Herbarium and Miss Ethel Z. Bailey of the Bailey Hortorium, the pertinent literature has been located. To the list of named forms of *Lilium philadelphicum andinum* (Nutt.) Ker-Gawler there should accordingly be added:

(5) f. **wausharaicum** (Hort.) Wherry, status novus. *L. wansharaicum* Hort. ex Leichtlin; *L. philadelphicum* var. *wansharaicum* Ducharte, Obs. Gen. Lis: 88, 1870 (nomen nudum); validated by description by Baker in Journ. Linn. Soc. **14**: 236, 1874; *L. philadelphicum* var. *waushariacum* (Hort.) Bailey, Stand. Cycl. Hort.: 1876, 1915 (corrected spelling, since the locality was Waushara, Wisconsin). The linear-leaved form of the subspecies.

---

[1] Rhodora 45: 397, 1943.

[2] Bull. Torr. Bot. Club 66: 367, 1939.

[3] Unfortunately too late for inclusion in Dr. Tatnall's Flora of Delaware and the Eastern Shore.

In the BARTONIA article above referred to the close morphologic relationship of *Lilium michiganense* to *L. canadense* was pointed out. Cytologic work published after that article had gone to press bears this out: Stewart, in Am. Journ. Bot. **34**: 15 and 19, 1947, described the chromosomes of 5 plants of each of these lilies, finding the *flavum* and *rubrum* variants of *L. canadense* to possess identical karyotypes, and " all were indistinguishable from *L. michiganense*."

EDGAR T. WHERRY
UNIVERSITY OF PENNSYLVANIA

Lemna trisulca, a Southward Extension of Range on the Atlantic Coastal Plain

N.J.: Pool on flood plain just south of Crosswicks Creek, about 100 yds. east-northeast of bridge, 2⅝ mi. south of Church and Main Sts., Allentown, Upper Freehold Township, southwestern Monmouth County, March 22, 1947, Stanley D. Wikoff 1066.

This was first found on September 15, 1946, while collecting *Crataegus* on the inner Coastal Plain of central New Jersey. The pool, situated at the lower end of a swale, is about 70 yards long by 20 yards wide and is connected by a brook with the creek some 40 yards distant. Specimens have since been collected on March 22, 1947; and also on January 30, 1949, occurring both on the bottom and frozen in thin ice. These collections are in the herbarum of the Academy of Natural Sciences of Philadelphia.

Previously *Lemna trisulca* L. has been definitely known on the Atlantic Coastal Plain only from Nantucket Island, Massachusetts (reported in M. L. Owen, A Catalogue of Plants . . . of Nantucket, Mass., 56, 1888; and by E. P. Bicknell in Bull. Torrey Club **36**: 2, 1909, and **45**: 373, 1918); Oakdale, Suffolk County, L. I., New York (reported by W. C. Ferguson in Torreya **30**: 11, 1930); and Irish Creek, New Lots, Kings County, L. I., New York (G. B. Brainerd, May 1866, in herbarium of Brooklyn Botanic Garden). This last may be the Irish Creek now known as Mill Basin about 4½ miles south of East New York (New Lots) and within ¾ of a mile north of Floyd Bennett Field. Although the last two stations and perhaps the first are south of the terminal moraine, a considerable proportion of the soil in these localities is outwash of glacial origin (silty loam of arkose derivation). Inland, away from the Coastal Plain, the plant is sometimes frequent, but wholly or chiefly in calcareous regions. It was one of several species believed by Bicknell to occur on Nantucket and to be absent from the New Jersey Coastal Plain, but of which some are now known there.

Associated with it in the pool and brook are *Lemna minor, Spirodela poly-*

rhiza, Utricularia vulgaris, and *Proserpinaca palustris.* Around the pool and brook are *Betula nigra, Fagus grandifolia, Quercus palustris, Crataegus crus-galli, Carya ovata, Carpinus caroliniana* var. *virginiana* (Marsh.) Fernald, and *Platanus occidentalis.* Nearby on the flood plain are *Acer negundo, Staphylea trifolia, Menispermum canadense,* and *Mertensia virginica.* Nearby on the bank surrounding the flood plain are *Dicentra cucullaria* and *Panax trifolium.* The locality is about 11 miles southeast of the " fall line " and 7 miles northwest of the Pine Barrens. The nearest station reputedly was Frankford, Pennsylvania, about 28 miles west-southwest (old specimens in the herbaria of the Academy of Natural Sciences of Philadelphia and the Philadelphia College of Pharmacy and Science).

In many places greensand marl can be seen on the surface of the flood plain. It is in the area attributed to Frenau loam, a soil containing greensand marl washed from the Collington and Sassafras soils of higher ground. Geologically it is in the area attributed to Englishtown sand which is not fossiliferous and only sparingly glauconitic. Since the geological maps of the region do not delimit the surficial formations, the flood plain may actually be the Marshalltown formation immediately above. This ranges from a black sandy clay to an argillaceous greensand (glauconite) marl and at some places is fossiliferous. Greensand marl contains silica, iron oxides, about 7% glauconite (a silicate of iron, potassium and alumina) and, in lesser quantities, other compounds of magnesium, calcium (as the carbonate, about 1%), phosphorus (about 0.4%), sodium, titanium, aluminum, manganese, and nitrogen.

STANLEY D. WIKOFF

ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA

Supplementary Notes on the Cladoniae of Pennsylvania

(With two Plates)

W. L. Dix

Since the writer published his " Cladoniae of Pennsylvania " in a previous number of Bartonia,[1] there have been discovered three privately printed lists of Cladoniae of Lancaster County, Pennsylvania—two by Mrs. Amelia F. Eby in 1894 and the other by A. A. Heller in 1893. Mrs. Eby's list records thirty specimens with seventeen species; Heller's list contains nineteen collections, three of which are by Dr. J. K. Small, including seventeen species.

Some of the records of Mrs. Eby's list are, however, open to question, especially such records as are not likely to occur in Lancaster County. The fact that many of her phanerogams have never again been collected in this county indicates a probability that some of her plants came from other territory. Consequently, only such specimens as are now represented in her collection at the Missouri Botanical Garden have been listed. These have all been examined by Dr. A. W. Evans of Yale University, and the identifications either confirmed or corrected.

A few new records of Pennsylvania Cladoniae are also included in an article by Dr. John W. Thomson, Jr., in the Bryologist, September, 1944, on " Some Lichens from Central Pennsylvania."

In the Bryologist, June, 1948, Hugh N. Mozingo published a list of the lichens of western Pennsylvania, a condensation of a thesis written for a degree of Master of Science at the University of Pittsburgh.[2] This article, largely an amplification of the work of Giardini at the same place in 1922, lists a few species of Cladoniae not accounted for in the Catalog of Pennsylvania Cladoniae. These will be mentioned in the Supplement in connection with the individual species.

Mention should also be made of two articles by Dr. Evans in which he has made some changes in the nomenclature of American Cladoniae. In his " Microchemical studies on the genus Cladonia, sub-genus Cladina,"[3] he has separated *C. submitis* from *C. mitis* Sandstede, partly on the basis of chemical differences. *C. submitis* also exhibits a tendency of the podetia to be more robust, with shorter, more numerous, and less curved ultimate branchlets. It has also a more restricted geographical distribution.

---

[1] 22: 32-62, 1943.

[2] Bryologist 52: 38-46, June, 1948.

[3] Rhodora 45: 417-438, November, 1943.

In "A Supplementary Report of the Cladoniae of Connecticut" Dr. Evans recognizes the separation by des Abbayes of most of the material in the United States now classified as *C. tenuis* (Floerke) Harm., but raises it from the rank of subspecies to that of full species, as *C. subtenuis* (des Abbayes) Evans.

Among other changes in this work Dr. Evans has separated *Cladonia atlantica* from *C. squamosa*, largely on account of the yellow reaction with P. He also reduces *C. mitrula* to synonymy under *C. capitata* (Michx.) Spreng., and *C. grayi* f. *aberrans* Asahina under *C. grayi* Merrill, and recognizes *C. cryptochlorophaea* Asahina and *C. merochlorophaea* Asahina, separated from *C. chlorophaea* again purely on chemical differences.

This Supplement follows the same general plan as the Catalog. Specimens collected by the author will bear only the date of collection; others will carry also the name of the collector. In addition to the collectors mentioned in the Catalog the following have contributed material for this supplement: Miss Gladys Beebe, Dr. Harold N. Moldenke, Hans Wilkens, Dr. George Zundel, George R. Proctor, E. T. Moul, and J. L. Rodda.

The location of some of the specimens here listed is as follows: AS, Academy of Natural Sciences, Philadelphia; C, Carnegie Museum, Pittsburgh, Pa.; NY, New York Botanical Garden, New York City; SI, Smithsonian Institution, Washington, D. C.; SMS, Herbarium of the Sullivant Moss Society, St. Louis, Missouri. In the last herbarium are also the specimens of Mrs. Eby, Mr. Heller, and Dr. Small, unless otherwise noted. The collections of Dr. Moldenke are in the author's herbarium. Nearly all the others are in the Osborn Botanical Laboratory, Yale University, New Haven, Conn.

Again the writer is indebted to Dr. Alexander W. Evans of Yale University for his kindness in examining practically all the new records of this supplement.

Species, varieties, and forms new to the state are indicated by an asterisk. The numbers refer to species cited in the Catalog.

Subgenus 1. Cladina (Nyl.) Web.

1. Cladonia rangiferina (L.) Web.

LANCASTER: Fite's Eddy (*Eby*, 1887), Reinhold's (*Eby*, 1894), Mountville (*Eby*, 1889). WARREN: Sheffield (*Moldenke*, 1945). WAYNE: Stockport (1943), Pocono Peak Lake (1946), Indian Orchard (1948).

*Cladonia rangiferina f. crispata Coem.

The peculiarity of this form is in its densely crowded and intricately entangled branches.

WAYNE: South Preston, Shehawken, Winterdale (1943).

*Cladonia rangiferina f. umbellata Anders.

In this form the ultimate branches appear as radiating whorls around open axils, resembling very much the similar detail in *C. alpestris*. See plate 3. fig. 5.

WAYNE: Scott Township (1943).

Cladonia rangiferina f. leucitica Flot.

WAYNE: Shehawken (1943).

2. Cladonia silvatica (L.) Hoffm.

LANCASTER: Fite's Eddy (*Eby,* 1889), McCall's Ferry (*MacElwee,* 1899). SUSQUEHANNA: Starrucca Station (1945). WARREN: Sheffield (*Moldenke,* 1945). WAYNE: Lake Como (1943).

*Cladonia silvatica f. setigera Oxner.

This form is marked by hair-like appendages growing from the tips of the branchlets or from the sides of the podetia.

WAYNE: Shehawken (1943).

*Cladonia silvatica f. subspumosa Sandst.

In this form the ultimate branchlets are short, crowded, scarcely nodding, and whorled around openings.

WAYNE: Shehawken (1946).

3. Cladonia mitis Sandstede.

The specimen of this species reported from Shehawken, Wayne County, in the Catalog belongs to *C. mitis* in the restricted sense. The following new records should be added:

SUSQUEHANNA: Starrucca Station (1946). WAYNE: Island Lake (1940).

*Cladonia submitis Evans.

An account of this new species is given in the introduction.

WAYNE: South Preston (1943), Shehawken (1946).

*Cladonia subtenuis (des Abbayes) Evans.

Dr. Evans believes that all the North American specimens formerly classified as *C. tenuis* belong to this species. Accordingly, all the records for *C. tenuis* in the Catalog should be transferred to *C. subtenuis.* New records follow:

BERKS: Scarlett's Mills (1943), Joanna (1943), Centerport, Friedensburg (*Wilkens,* 1946). LANCASTER: Conestoga (*Eby,* 1894), Mt. Gretna (*Eby,* 1889), Reinhold's (*Eby,* 1884), Russell Hill (*Eby,* 1895), Martic forge and Welch Mt. (*Small,* 1892), McCall's Ferry (*MacElwee,* 1899). WAYNE: Equinunk (1948).

5. Cladonia alpestris (L.) Rabenhorst.

This is a rare species in Pennsylvania. A single clump was found in 1939, and another in 1944 about a half mile west from the original location. This year, 1948, a third specimen was found in a cranberry bog about four miles northwest of these places. In October of the same year more material was found growing on very thin soil over the bare rocks that cover the top of the Moosic Range at an elevation of about 2000 feet. Although this location is about twenty miles south of the other collections in Scott Township and at about the same elevation, it is really higher geologically, as these rocks here belong to the Carboniferous period and those of Scott Township to the Upper Devonian.

WAYNE: w. of Island Lake (1944), n.w. of Scott Center (1944), e. of Forest City (1948). LAWRENCE: East Newcastle (*John Bright,* 1929). Reported by Mozingo.

*Cladonia evansii des Abbayes.

LANCASTER: Fite's Eddy (*Eby,* 1887).

The specimen on which this record is based was labelled *C. rangiferina* v. *alpestris,* as were two other specimens which proved to be *C. subtenuis.* If this specimen was really collected in Lancaster County, it is far out of its supposed range which is more southern. Dr. Evans has identified it as such with some hesitation and notes that it lacks the characteristic tufted shape of both *C. alpestris* and *C. evansii.*

Subgenus 2. Pycnothelia Ach.

6. Cladonia papillaria (Ehrh.) Hoffm.

BERKS: Joanna (1943), Friedensburg (*Wilkens,* 1946). WAYNE: Lake Como (1943).

Subgenus 3. Cenomyce (Ach.) Th. Fr.

Section 1. Cocciferae Del.

Subsection 1. Subglaucescentes Vainio

7b. Cladonia floerkeana v. carcata (Ach.) Nyl.

WAYNE: Scott Township (1944).

8. Cladonia bacillaris (Ach.) Nyl.

BERKS: Joanna (1943). WARREN: Sheffield (*Moldenke,* 1945).

*Cladonia bacillaris f. subscyphifera Vainio.

In this form the podetia have narrow, irregular cups, with pedicillate apothecia on their margins. This is the first collection of this form in America.

WAYNE: 1 mi. n. of Island Lake (1946).

9. Cladonia macilenta Hoffm.

WARREN: Warren (*Moldenke,* 1943). WAYNE: Lake Como (1943), Bigelow Lake (1945).

Cladonia macilenta f. styracella (Ach.) Vainio.

WAYNE: e. of Forest City (1948).

*Cladonia didyma f. squamulosa Robbins.

This form is characterized by the presence of squamules on the podetia.

HUNTINGDON: Nature Camp (*Thompson,* 1939). This record was inadvertently omitted from the Catalog. YORK: Ewingsville (*E. T. Moul,* 1946).

Subsection 2. Stramineo-flavidae Vainio

[11. Cladonia coccifera (L.) Willd.

The specimen listed in the Catalog from Kittaning, Armstrong County, collected by *Dr. Sumstine* in 1902 proves to be *C. pleurota.* Consequently this species should be removed from the list of Pennsylvania Cladoniae.]

12. Cladonia pleurota (L.) Web.

Huntingdon: Warrior Ridge (*T. C. Porter,* 1890).

Cladonia pleurota f. decorata Oliv.

Chester: Everhart's Woods (No data. Probably collected by *Michener*). Warren: Sheffield (*Moldenke,* 1945).

13. Cladonia deformis (L.) Hoffman.

Warren: Sheffield (*Moldenke,* 1945).

15. Cladonia cristatella Tuck.

All the following records, except those of Muhlenberg, Dr. Sumstine, and Mrs. Eby were inadvertently omitted from the Catalog.

Armstrong: Johnetta (*O. E. Jennings,* 1921, C.) Blair: Tyrone (*Jennings,* 1904, C.). Butler: Nixon Station (*Milward,* 1917, C.). Center: Scotia (*Jennings,* 1905, C.). Clarion: Cook Forest (*D. R. Sumstine,* 1947). Crawford: Pymatuming Swamp (*Jennings,* 1905, 1907, C.). Elk: Dent's Run (*Jennings,* 1904, C.). Erie: Presque Isle (*Jennings,* 1906, C.). Fayette: Indian Creek Valley (*Jennings,* 1916, C.), Ohiopyle (*Jennings,* 1906, *G. E. Kinzer,* 1905, *Sumstine,* 1906, C.). Franklin: Charmian (*Mrs. E. C. White,* 1936, SI). Huntingdon: Nature Camp (*Thompson,* 1938). Lancaster: McCall's Ferry (*A. A. Heller,* 1892, NY), Conewago (*Heller,* 1892, SI), Chestnut Hill (*Eby,* 1894, MBG). Lawrence: Wolf Creek Valley (*S. H. Williams,* 1921, C.). Monroe: Water Gap (*Evans,* 1941). Northampton: Bethlehem (*Muhlenberg,* as "Cenomyce digitata"). Philadelphia: Philadelphia (*Miss Morris,* NY). Pike: Bushkill Falls (1940). Somerset: Somerset (*Sumstine,* 1905, C.). Sullivan: Bernice and Forksville (*Nearing,* 1939). Washington: Manlin (*Jennings,* 1908, C.).

Cladonia cristatella f. beauvoisii (Del.) Vainio.

Berks: Scarlett's Mills (1943), Friedensburg (*Wilkens,* 1946). Elk: Glen Hazel (*Moul,* 1946). Huntingdon: Union Furnace (*G. R. Proctor,* 1947). Lancaster: Little Conestoga (*Eby,* 1887, MBG), Chestnut Hill (*Eby,* 1894, MBG). Lycoming: Ellenton (*Nearing,* 1939), Hepburnville (1941). Northampton: Little Gap (*J. L. Rodda,* 1942). Warren: Sheffield, Warren, (*Moldenke,* 1943). Wayne: Pleasant Mount (1943).

Cladonia cristatella f. vestita Tuck.

Berks: Scarlett's Mills (1943). Lancaster: Mountville (*Eby,* 1894, SMS). Lycoming: Ellenton (*Nearing,* 1939), Hepburnville (1941). Northampton: Bethlehem (*Schweinitz,* as "Cenomyce digitata", AS). Potter: Coudersport (*Gladys Beebe,* 1944). Warren: Sheffield and Warren (*Moldenke,* 1943). Wayne: Mount Pleasant (1943).

Cladonia cristatella f. squamulosa Robbins.

Berks: Scarlett's Mills (1943).

Cladonia cristatella f. ochrocarpia Tuck.

Bucks: Washington's Crossing (1947).

Cladonia cristatella f. scyphulifera Sandst.

Warren: Warren (*Moldenke,* 1945).

16. Cladonia incrassata Floerke.

WARREN: Warren (*Moldenke,* 1943).

Section 2. Ochrophaeae Vainio

Subsection 1. Unciales (Del.) Vainio

17. Cladonia uncialis (L.) Web.

BERKS: Scarlett's Mills (*Wilkens,* 1946). WAYNE: 1 mi. n. of Shehawken (1944), e. of Honesdale (1948).

18. Cladonia caroliniana (Schwein.) Tuck.

LANCASTER: Chestnut Hill (*Eby,* 1890, MBG). The material reported from Venango County by Mozingo proves to be *C. uncialis.*

Cladonia caroliniana f. dilatata Evans.

BERKS: Scarlett's Mills (1943). BUCKS: Yardley (1948).

Cladonia caroliniana f. tenuiramea Evans.

BERKS: Friedensburg (*Wilkens,* 1946).

*Cladonia boryi f. lacunosa (Bory) Tuck.

LANCASTER: Fite's Eddy (*Eby,* 1899, MBG).

The podetia in this form are cupless, with blunt ultimate branches, and their wall perforated in well-developed specimens.

Subsection 2. Chasmariae (Ach.) Vainio

Group 1. Microphyllae Vainio

19a. Cladonia furcata v. racemosa (Hoffm.) Floerke.

LANCASTER: Chestnut Hill (*Eby,* 1890, MBG). Hopewell (*Eby,* 1894, MBG). Sumney's Woods (*Eby,* 1893, MBG). WARREN: Sheffield (*Moldenke,* 1945). WAYNE: Pocono Peak Lake (1946).

Cladonia furcata v. racemosa f. corymbosa (Ach.) Vainio.

WAYNE: Lake Como (1943), Stockport (1943).

Cladonia furcata v. racemosa f. furcatosubulata (Hoffm.) Vainio.

WARREN: Warren (*Moldenke,* 1943), Sheffield (*Moldenke,* 1945). WAYNE: Starrucca Borough (1943).

Cladonia furcata v. racemosa f. squamulifera Sandst.

LANCASTER: Chestnut Hill and Reinhold's (*Eby,* 1894, MBG), Little Conestoga Creek (*Small,* 1894), Sumney's Woods (*Eby,* 1893, MBG). MONROE: n. of Marshall's Creek (1944). WARREN: Warren (*Moldenke,* 1943).

*Cladonia furcata v. pinnata f. truncata.

The podetia in this form are often laterally fissured, and produce apothecia in corymbose clusters on the terminal branches.

HUNTINGDON: Nature Camp (*Thompson,* 1937).

Cladonia furcata v. pinnata f. turgida (Scriba) Sandst.

WAYNE: Scott Township (1945), Starrucca Borough (1943).

20a. Cladonia scabriuscula f. farinacea (Vainio) Sandst.

WAYNE: Shehawken-Starrucca Road (1943), Equinunk (1948).

*Cladonia scabriuscula f. elegans Robbins.

WAYNE: Mt. Ararat, elevation 2600 ft. (1947).

This form was growing on the face of a moss-covered sandstone cliff. It is a very striking form of this species, and resembles somewhat a heavily squamulose form of *C. furcata*. But the podetia are more robust, less interwoven, and more erect. The tips are without the usual soredia. Dr. Evans reports that he has collected this form in the United States only in northern New England. (Plate 2, fig. 3.)

*Cladonia crispata (Ach.) Flot.

This is distinctly a northern species and has not been reported south of New England. This is the first collection in Pennsylvania. The always present cortex of *C. crispata* will usually separate it from the somewhat similar forms of *C. squamosa* which exhibits areas of disintegrating cortex. From *C. furcata* it can be separated by its negative reaction to P. (Plate 3, fig. 1.)

WAYNE: Island Pond (1945).

23. Cladonia squamosa (Scop.) Hoffm.

CARBON: Little Gap (*Rodda*, 1942). ELK: Glen Hazel (*Moul*, 1946). LANCASTER: Chestnut Hill (*Eby*, 1884, 1893, 1895, MBG), Mountville (*Eby*, 1886, MBG), Penryn P. (*Small*, 1890), Welch Mt. (*Small*, 1892). WARREN: Warren, Sheffield (*Moldenke*, 1945).

Cladonia squamosa f. denticollis (Hoffm.) Floerke.

WAYNE: Shehawken-Starrucca Road (1943).

Cladonia squamosa f. levicorticata Sandst.

HUNTINGDON: Warrior Ridge (*T. C. Porter*, 1890, AS).

*Cladonia atlantica Evans f. ramosa Evans.

Cladonia atlantica has recently been segregated by Dr. Evans from *C. squamosa* largely on the basis of its yellow reaction to P. *C. squamosa* is negative. This yellow reaction is probably due, according to Asahina, to the presence of baeomycic acid. Dr. Evans does not point out any morphological differences, but mentions a more restricted area for the new species " extending from Cape Cod southward, mostly near the coast, with an extension into Alabama. Some of the records of this species listed below represent specimens formerly assigned to *C. squamosa* in the Catalog.

BUCKS: Morrisville (1939-40, 1942), Yardley (1947). HUNTINGDON: Nature Camp (*Thompson*, 1939). MONROE: Mt. Godfrey, Naomi Pines, Pocono Pines (*Evans*, 1941). PIKE: Bushkill Falls (1940). SUSQUEHANNA: Starrucca Station (1941). WAYNE: Shehawken (1939-40), Scott Township (1941, 1943, 1948).

*Cladonia atlantica f. ramosissima Evans.

The podetia of this form are more compactly branched than those of f. *ramosa*. and they are practically cupless.

WAYNE: Starrucca Borough (1943).

25. Cladonia delicata (Ehrh.) Floerke.

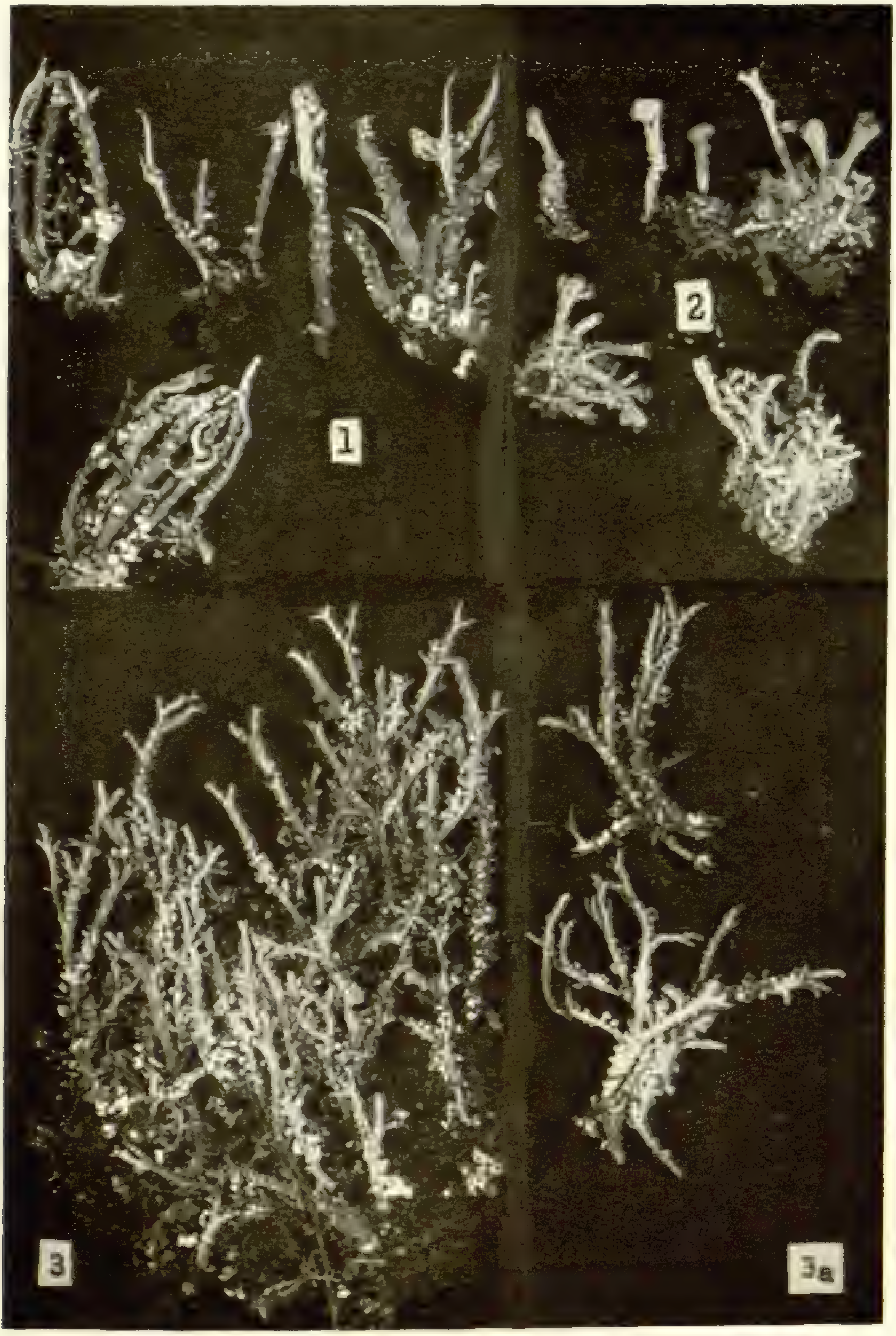


FIG. 1. Cladonia cornuta f. cylindrica, (without squamules). C. cornuta f. phyllotoca (with squamules). X 1.25. FIG. 2. Cladonia pityrea v. zwackhii f. squamulifera (with squamules). C. pityrea v. zwackhii f. subacuta (without squamules). X. 1.25. FIG. 3. Cladonia scabriuscula f. elegans Robbins. Habit. FIG. 3a. Single podetium. Figs. x. 1.

Photographs by A. Delwin Warden

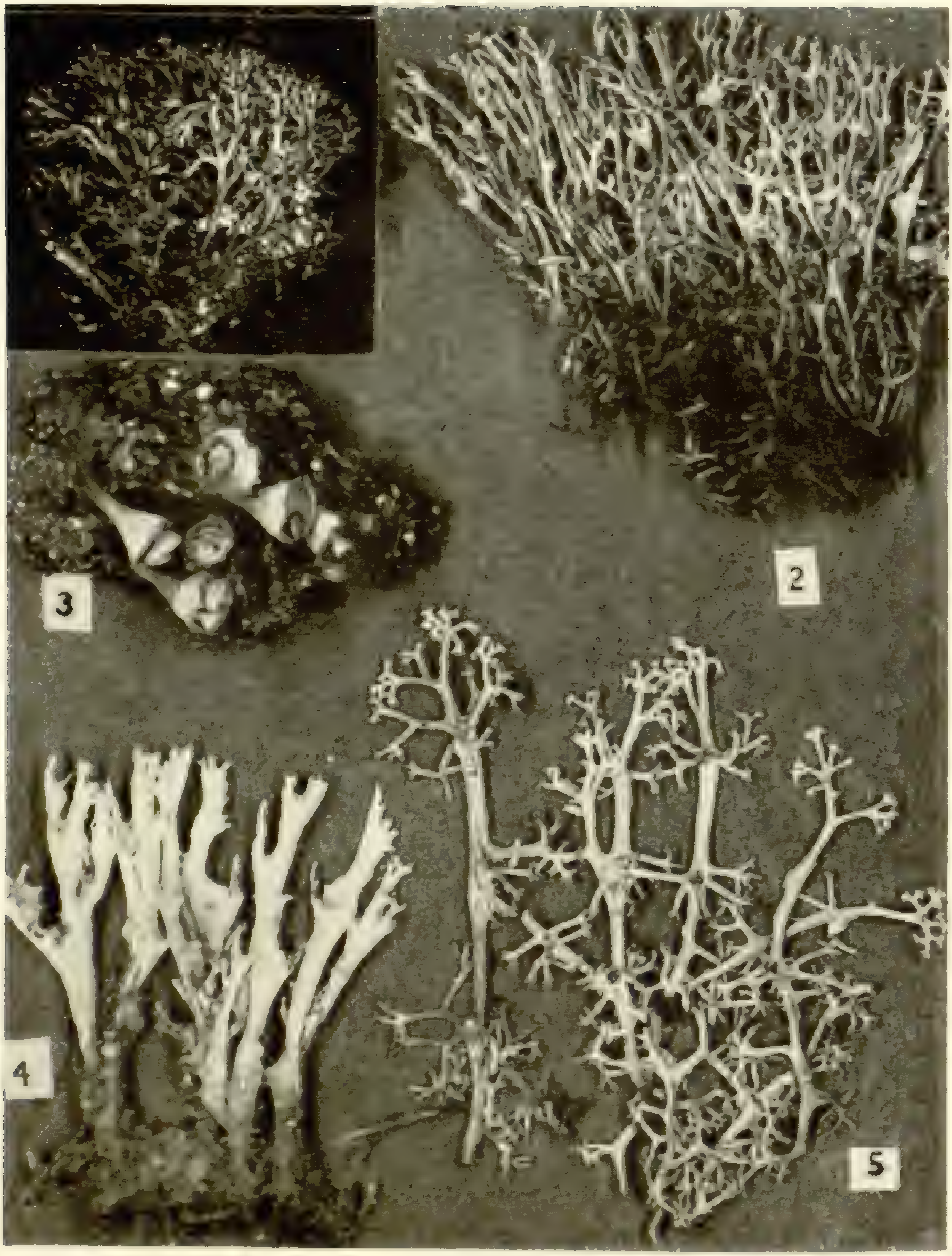


FIG. 1. Cladonia crispata f. cetrariaeformis x 1.25. FIG. 2. C. gracilis v. chordalis. FIG. 3. C. conista f. centralis. FIG. 4. C. cenotea f. crossota (from Catalog, 1942-3.) FIG. 5. C. rangiferina f. umbellata. Figs. 2-5 X 1.5

Photographs by A. Delwin Warden

WARREN: Warren (*Moldenke*, 1943).

Cladonia delicata f. quercina (Pers.) Vainio.

HUNTINGDON: Nature Camp (*Thompson*, 1937).

26. Cladonia caespiticia (Pers.) Floerke.

WAYNE: Scott Township (1944).

Group 2. Megaphyllae Vainio

27. Cladonia apodocarpa Robbins.

BUCKS: Black Eddy (*Proctor*, 1946). ELK: Glen Hazel (*Moul*, 1946).

28c. Cladonia turgida f. squamulosa (Rabenh.) Theobald.

WAYNE: Scott Township (1944).

Subsection 3. Clausae Vainio

Group 1. Podostelides (Wallr.) Vainio

Subgroup 1. Helopodium (Ach.) Vainio

*Cladonia capitata (Michaux) Spreng.

As indicated in the introduction, Dr. Evans has reduced *Cladonia mitrula* Tuckerman to synonymy under the above species. His reason for doing so is that "*C. leptophylla* and *C. mitrula* represent the same species . . . and that both have been pronounced synonyms of *Helopodium capitatum* Michx." which was transferred to the genus Cladonia in 1827 by Sprengel. This removal of *C. mitrula* from the nomenclature of Cladoniae thereby eliminates from that genus the only name based upon a Pennsylvania collection. Tuckerman published it in Darlington's Flora Cestrica in 1853. In consideration of this abandonment of the name *C. mitrula*, the records of that species listed in the Catalog should be transferred to *C. capitata* and its corresponding forms. The following additional collections are here listed:

*Cladonia capitata f. imbricatula (Nyl.) Evans.

BERKS: Friedensburg, Pricetown (*Wilkens*, 1946). FRANKLIN: between Shippensburg and Fayette (*Dr. Geo. Zundel*, 1935). PIKE: n. of Marshall's Creek (1943).

*Cladonia capitata f. microcarpa Evans.

This form is characterized by its minute podetia in crowded terminal clusters. (Plate .)

SUSQUEHANNA: Starrucca-Thompson Road (1943).

30a. Cladonia clavulifera f. nudicaulis Evans.

BUCKS: Washington's Crossing (1946).

Cladonia clavulifera f. subvestita Robbins.

WAYNE: Pleasant Valley Road, Starrucca Borough (1943).

Cladonia clavulifera f. pleurocarpa Robbins.

WAYNE: South Preston (1943).

31a. Cladonia subcariosa f. evoluta Vainio.

Berks: Joanna (1943). Warren: Warren (*Moldenke,* 1943).

*Cladonia subcariosa f. ramosa Dix.[4]

This form is separated from f. *evoluta* by its habit of branching and proliferating from the tips and the sides of the podetia.

Bucks: Morrisville (1943).

*Cladonia brevis Sandst.

Huntingdon: Nature Camp (*Thompson,* 1937). Monroe: Mt. Godfrey (*Evans,* 1941).

Both these records for *C. brevis,* the only ones from Pennsylvania, were inadvertently omitted from the Catalog. *C. brevis* can de distinguished from its associates by its reaction to K and P, K^- and P yellow. Often the podetia are conspicuously fissured as in *C. cariosa* which is K yellow.

[Cladonia polycarpia Merrill.

The material of this specimen reported by Mozingo from Cambria County shows a definite reaction with K, and therefore should be *C. subcariosa.*]

32. [Cladonia cariosa (Ach.) Spreng.

None of the collections reported by Mozingo prove to belong to this species. As the specimens listed under this species in the Catalog are included among those in his list, *C. cariosa* must be temporarily, at least, removed from Pennsylvania Cladoniae.]

Group 2. Thallostelides Vainio

34. Cladonia gracilis (L.) Willd.

Warren: Sheffield (*Moldenke,* 1945).

*Cladonia gracilis f. chordalis (Floerke) Schaer.

In this variety, if cups are present, they are much narrower than in v. *dilatata;* when cupless, the podetia are narrowly cylindric, and terminate in long acuminate points. The cups may also bear proliferations. (Plate 3, fig. 2.)

Lancaster: Hopewell (*Eby,* 1894, MBG). Wayne: Scott Township (1944).

Cladonia gracilis v. dilatata f. anthocephala (Floerke) Vainio.

Potter: Coudersport (*Beebe,* 1944). Wayne: Scott Township (1943).

35. Cladonia verticillata (Hoffm.) Schaer.

Clarion: Cook Forest (*Sumstine,* 1937). Fayette: Ohiopyle (*Jennings,* 1907, C. Omitted from Catalog).

Cladonia verticillata f. evoluta (Th. Fr.) Stein.

Huntingdon: Warrior Ridge (*Porter,* 1890, AS). Northampton: Little Gap (*Rodda,* 1942). Potter: Coudersport (*Beebe,* 1944). Warren: Sheffield and Warren (*Moldenke,* 1943).

Cladonia verticillata f. apoticta (Ach.) Vainio.

Pike: Porter's Lake (1944). Wayne: Equinunk (1948).

Cladonia verticillata f. aggregata (Del.) Oliv.

Wayne: South Preston (1943), Equinunk (1948).

---

[4] Bryologist, Vol. 46, Sept., 1943.

37a. Cladonia degenerans f. phyllophora (Erhr.) Flot.

Wayne: Scott Township (1943).

*Cladonia degenerans f. cladomorpha (Ach.) Vainio.

Wayne: Island Lake (1947).

39a. Cladonia pyxidata v. neglecta (Floerke) Mass.

Berks: Pricetown (*Wilkens,* 1946). Carbon: Little Gap (*Rodda,* 1942). Lancaster: Conewago (*Small,* 1889). Wayne: Lake Como (1943).

*Cladonia pyxidata v. neglecta f. peritheta (Wallr.) Robbins.

The podetia of f. *peritheta* are proliferous from the outer surface of the cups and from the surface below the cups.

Huntingdon: Nature Camp (*Thompson,* 1938, omitted from the Catalog). Wayne: Starrucca Borough (1943).

40a. Cladonia chlorophaea f. simplex (Hoffm.) Arn.

Huntingdon: Nature Camp (*Thompson,* 1937, omitted from the Catalog). Blair: Union Furnace (*Proctor,* 1947). Lancaster: Mountville (Eby, 1885, 1887, MBG). Monroe: Water Gap (*E. A. Rau,* 1874, AS), n. of Marshall's Creek (1944). Warren: Warren (*Moldenke,* 1943).

Cladonia chlorophaea f. carpophora (Floerke) Anders.

Wayne: Pleasant Valley Road, Scott Township, and Mt. Pleasant (1943).

Cladonia chlorophaea f. prolifera (Wallr.) Arn.

Elk: Glen Hazel (*Moul,* 1946). Wayne: Mt. Pleasant (1943).

41a. Cladonia grayi f. simplex Robbins.

Potter: Coudersport (*Beebe,* 1944). Warren: Warren (*Moldenke,* 1943).

Cladonia grayi f. carpophora Evans.

Berks: Joanna (1943. Wayne: Stockport (1943).

Cladonia grayi f. cyathaformis Sandstede.

Franklin: Black Gap (*Zundel,* 1935). Huntingdon: Warrior Ridge (*Porter,* 1890, AS).

42a. Cladonia conista f. simplex Robbins.

Huntingdon: Warrior Ridge (*Porter,* 1890, AS). Monroe: Stroudsburg (1943).

*Cladonia conista f. **centralis**, scyphis secundis ex centro scyphorum primorum enatis.

This form has secondary cups growing from the center of the primary cups. It is analogous to *C. pyxidata* v. *neglecta* f. *centralis.* (Plate 3, fig. 3.)

The type of this form, the author's collection from Scarlett's Mills, is in his herbarium.

Berks: Scarlett's Mills (1944). Monroe: Lake Minisink (1945).

43. Cladonia fimbriata (L.) Fr.

Huntingdon: Warrior Ridge (*Porter*, 1890, AS). **Warren**: Warren, Sheffield (*Moldenke*, 1943).

45. Cladonia nemoxyna (Ach.) Nyl.

Warren: Warren (*Moldenke*, 1945).

Cladonia nemoxyna f. fibula (Ach.) Vainio.

Bucks: Yardley (1947). **Lancaster**: Martic Forge (Small, 1892, MBG). This specimen is one labeled *Cladonia cenotea* on a sheet in the Missouri Botanical Garden. I believe it represents the same collection as that of the same date and locality in the National Herbarium at Washington. Accordingly the record for 24. *C. cenotea* in Lancaster County is cancelled. **Monroe**: Porter's Lake (1944). **Northampton**: Little Gap (*Rodda*, 1942).

Cladonia nomoyxna f. rei (Schaer.) Anders.

Wayne: Winterdale (1943).

46. Cladonia ochrochlora Floerke.

Susquehanna: Nicholson (1947). **Wayne**: Stockport (1943).

Cladonia ochrochlora f. ceratodes Harm.

Fayette: Ohiopyle (*Jennings*, 1907, C). Omitted from the Catalog. This specimen doubtless represents *C. coniocraea* f. *ceratodes* (Floerke) Dalla Torre et Sarnth.

*Cladonia cornuta f. cylindrica (Schaer) Vainio, and f. pryllotoca (Floerke) Vainio.

Wayne: Island Lake (1945).

This species is new for Pennsylvania. It often grows in clumps, erect, usually sorediate on the upper part of the branches, and occasionally squamulose toward the base. When cups are present, they are small, with dentate or proliferate margins, the cavity deep and sorediate. In f. *phyllotoca* the base of the podetia is covered with squamules. (Plate 2, fig. 1.)

47. Cladonia coniocraea (Floerke) Spreng.

Elk: Glen Hazel (*Moul*, 1946). **Potter**: Coudersport (*Beebe*, 1943). **Warren**: Warren (*Moldenke*, 1943).

Cladonia coniocraea f. ceratodes (Floerke) Dalla Torre et Sarnth.

Huntingdon: Shaffersville, Union Furnace (*Proctor*, 1947). **Schuylkill**: Port Clinton (*Wilkens*, 1946). **Warren**: Sheffield (*Moldenke*, 1945).

Cladonia coniocraea f. phyllostrota (Floerke) Vainio.

Huntingdon: Shaffersville (*Proctor*, 1947).

48a. Cladonia borbonica f. cylindrica Evans.

Center: State College (*Sumstine*, 1947). **Lancaster**: Mountville (*Eby*, 1889, MBG). **Susquehanna**: Starrucca-Thompson Road (1943), Nicholson (1947).

49a. Cladonia pityrea v. zwackhii Vainio.

Warren: Warren (*Moldenke*, 1943).

Cladonia pityrea v. zwackhii f. subacuta Vainio.

Monroe: Stroudsburg (1943). **Warren**: Sheffield (*Moldenke,* 1945).

Cladonia pityrea v. zwackhii f. squamulifera Vainio.

Carbon: Little Gap (*Rodda,* 1942). **Wayne**: Scott Twp. (1947). (Plate 2, fig. 2.)

Group 3. Foliaceae (Bagl. & Garest.) Vainio

*Cladonia Robbinsii Evans.

This new species was described by Dr. Evans in his Supplementary Report of the Cladoniae of Connecticut in 1944. It bears a similarity to *C. apodocarpa* and *C. foliacea,* growing in large mats and seldom exhibiting podetia. It can, however, be distinguished from the former by the cream colored under side of its squamules instead of the chalky white ones of *C. apodocarpa,* and from *C. foliacea* by the absence of rhizinae on the margins of its much smaller squamules.

Chester: Nottingham (*Nearing,* 1940). **Monroe**: Delaware Water Gap (*Evans,* 1941), ca. 10 mi. n. of Marshalls Creek (1943). **Perry**: Sterrett's Gap (1941).

51b. Cladonia piedmontensis f. squamulosa Robbins.

Wayne: Scott Township (1945).

In this Report two species listed in the Catalog, *C. coccifera* and *C. cariosa,* have been eliminated from the Cladoniae of Pennsylvania. Eight species new to the state have been reported; *C. submitis, C. evansii, C. boryii, C. atlantica, C. brevis, C. crispata, C. cornuta,* and *C. robbinsii.* This makes a total of 57 species now found in the state, exclusive of two recent segregations from the *C. chlorophaea* group, *C. cryptochlorophaea* and *C. merochlorophaea.* Also, about 12 forms new to the state, and one new form described by the writer, have been listed.

Three counties, Adams, Cameron, and Cumberland, still remain without any reported collection of Cladoniae. Many counties in the northwestern and west-central part of the state are represented by only four or five specimens. The most thoroughly represented counties are Wayne with 50 species, Monroe with 38, and Pike with 35. Species not yet found in the state and to be looked for are: *C. impexa, C. glauca, C. cariosa, C. norrlini, C. cornutoradiata,* and possibly *C. foliacea.*

3 25:96
1948

Shorter Notes

A plastic spray for coating herbarium specimens.—There has recently been placed on the market a plastic spray, under the name of Krylon. One presses the top of the can, and a fine stream of the material comes out and deposits on any object held near. The film is colorless and transparent, and so flexible that herbarium sheets coated with it can be rolled into a cylinder, and when unrolled again the plant specimens are undamaged. At last we have a means for keeping hemlock and spruce needles attached to the stems when pressed! Teachers of taxonomy can hand a sheet around to any number of students without the plant material crumbling (as happens in unprotected or cellophane-covered sheets).

EDGAR T. WHERRY

Lee Sowden

The Philadelphia Botanical Club lost one of its members of long standing through the death of Lee Sowden on July 28, 1947.

Mr. Sowden was born in Philadelphia, July 22, 1874. He attended Central High School and then Cornell University for two years.

He was well known in banking circles and served as president of the North Philadelphia Trust Company for a period of twenty-eight years until 1946 when he retired as president and was elected chairman of the board in which capacity he served until the time of his death. He was one of the founders of the Title Company of Philadelphia and served as its president from 1927 to 1929. He was also a director of the Commonwealth Title Company of Philadelphia.

Mr. Sowden was active in the affairs of the Episcopal church. He was a vestryman of the Memorial Church of the Good Shepherd and a member of the Church Club of Philadelphia.

Mr. Sowden took a life-long interest in botany and joined the Philadelphia Botanical Club in 1901. He served as its secretary from 1910 to 1918 inclusive. He became the Club's second treasurer in 1939 when he was elected to succeed the late Arthur N. Leeds, and he continued to serve in this capacity until the time of his death.

In his earlier years his favorite collecting ground was along the Wissahickon Creek near Philadelphia. After he joined the Club he went on trips with Stewardson Brown, S. S. Van Pelt, Joseph Crawford, and others, to some of the classic collecting spots along the Susquehanna River in Lancaster County, Pennsylvania, in the Cape May, New Jersey, region, and elsewhere. During his annual vacations he visited sections of the United States and Mexico and always took an interest in the flora of the region visited.

After his death his collection of local plants was donated to the Philadelphia Botanical Club and his general collection to the Academy of Natural Sciences.

WALTER M. BENNER

Program of Meetings during 1946

Date	*Subject*	*Speaker*	*Attendance*
Jan. 24	Mount Shasta Rambles	William Bridge Cooke	31
Feb. 28	Some Interesting American Botanists	Howard W. Elkinton	15
Mar. 28	Kodachromes of Local Wild Flowers	Samuel A. Tatnall	
	Problems of the Amateur	Dr. Samuel C. Palmer	36
Apr. 25	Four Seasons in the Yukon	Frederick C. Schmid	
	Sixteen Days at Yakutat, Alaska	Leslie D. Stair	43
May 23	Plants of Nearby Ponds, Streams and Sea	Ruth Patrick	23
Sept. 26	Fungi	David R. Sumstine	33
Oct. 24	The North American Species of Mimulus	Francis W. Pennell	30
Nov. 21	Australia—Her Flowers as Seen by an Amateur	John W. Hess	50
Dec. 19	Native Plants of Horticultural Interest	Edgar T. Wherry	51

Program of Meetings during 1947

Date	*Subject*	*Speaker*	*Attendance*
Jan. 23	Mostly Lilies	Mrs. J. Norman Henry	50
Feb. 27	Marvels of Myxomycetes and Fungi	Charles E. Mohr	26
Mar. 27	Flowers of the High Tropical Andes	Mary Barnas Francis W. Pennell	28
Apr. 24	Botanizing on the Gaspe Peninsula	George R. Proctor	31
May 22	Plants of the Red Plains of Texas	Richard W. Pohl	35
Sept. 25	Reports by Members on Summer Work		
	Local Species of Aster	George R. Proctor	25
Oct. 23	Local Species of Eupatorium	Walter M. Benner	
	Some Problems of Fern Study	George R. Proctor	25
Nov. 20	Flora of the Cape Cod Peninsula	Edwin T. Moul	
	Two Local Species of Utricularia	Theodore P. Haas	30
Dec. 18	Studies of North American Ericaceae	Edgar T. Wherry	40

Program of Meetings during 1948

Date	*Subject*	*Speaker*	*Attendance*
Jan. 22	Flora of the Carolina Blue Ridge	Ralph M. Sargent	26
Feb. 26	More Native Plants at Gladwyne	Mrs. J. Norman Henry	42
Mar. 25	Studies of Shale Barren Plants	Robert B. Platt	25
Apr. 22	Botanizing in Indiana	John H. Wallace	21
May 27	Flora of Northampton County, Penna.	Robert L. Shaeffer, Jr.	23
Sept. 23	Reports by Members on Summer Work		
	The Genus Bidens in the Local Area	George R. Proctor	13
Oct. 28	Historic Plant Collections at the Academy of Natural Sciences	Edward E. Wildman and Francis W. Pennell	24
Nov. 18	Wild Flowers of the Alleghanies	H. P. Sturm	37
Dec. 16	From Popayán to the Putumayo	Victor W. von Hagen	32

List of Officers and Members, 1946-1947-1948

Francis W. Pennell, *President*
Mrs. J. Norman Henry, *Vice-President*
Walter M. Benner, *Secretary*
Lee Sowden, *Treasurer* until July 28, 1947
Harry W. Trudell, *Treasurer* from Sept. 25, 1947
Bayard Long, *Curator*
Francis W. Pennell, *Editor of* BARTONIA

ACTIVE MEMBERS

(as of September 1, 1949)

	Elected
J. W. Adams, 32 Pleasant St., Philadelphia 19, Pa.	1925
Walter Ainsworth, 3202 Hamilton St., Philadelphia 4, Pa.	1946
D. Curry Armstrong, 124 Bridge St., Morton, Pa.	1946
Mrs. A. C. Barnes, Latch's Lane, Merion, Pa.	1942
Edwin B. Bartram, Bushkill, Pa.	1906
J. Russell Bebler, 6245 Wissahickon Ave., Philadelphia 44, Pa.	1919
Dr. Walter M. Benner, 5636 Loretta Ave., Philadelphia 24, Pa.	1912
Jasper T. Bentley, 201 W. Chestnut Hill Ave., Philadelphia 18, Pa.	1933
Dr. David Berkheimer, 518 Elm St., Reading, Pa.	1943
Carl E. Bliss, 2106 Overbrook Road, Lakewood, Ohio	1924
Miss Ruth Boyer, 2039 Cherry St., Philadelphia 3, Pa.	1946
John Bright, 511 Cheltena Ave., Jenkintown, Pa.	1943
Miss Ethel Brubaker, "The Fairfax", 43rd & Locust Sts., Philadelphia 4, Pa.	1939
William C. Brumbach, Esterly, Pa.	1943
Richard B. Chillas, 233 Winona Ave., Philadelphia 44, Pa.	1942
Prof. M. A. Chrysler, Chaplin, Conn.	1931
F. Van Buren Connell, "Hollybrook", Brookside Ave., Wayne, Pa.	1924
Joseph Devlin, 4030 Bleigh St., Philadelphia 36, Pa.	1946
D. E. Dimmick, 21 N. 7th Street, Easton, Pa.	1946
W. L. Dix, 801 Crown St., Morrisville, Pa.	1942
Robert R. Dreisbach, 301 Helen St., Midland, Mich.	1922
Miss Elizabeth C. Earle, 4209 Chester Ave., Philadelphia 4, Pa.	1935
Howard W. Elkinton, 6514 Germantown Ave., Philadelphia 19, Pa.	1931
Mrs. Nellie Erisman, 1821 Mt. Vernon St., Philadelphia 30, Pa.	1945
Mrs. Harold Evans, "Awbury", E. Washington Lane, Philadelphia 38, Pa.	1931
Richard Blossom Farley, "Sarobia", Eddington, Pa.	1931
Carl W. Fenninger, 1632 Chestnut St., Philadelphia 3, Pa.	1947
Albert J. Ferkel, 1101 N. 63rd St., Philadelphia 31, Pa.	1948
Miss Elizabeth H. Flavell, 142 W. Chelten Ave., Philadelphia 44, Pa.	1946
Dr. John M. Fogg, Jr., University of Pennsylvania, Philadelphia 4, Pa.	1921
Fairman R. Furness, Media, Pa.	1935

Miss Elizabeth A. Gest, R. D. 1, Telford, Pa.	1944
John Gill, 2 Linden Ave., Haddonfield, N. J.	1939
Mrs. John Gilpin, Sugar Loaf Orchard, Chestnut Hill, Philadelphia 18, Pa.	1943
Dr. Thomas S. Githens, Cambridge Apartments, School Lane and Wissahickon Ave., Philadelphia 44, Pa.	1945
Dr. Robert B. Gordon, 415 Sharpless St., West Chester, Pa.	1942
Dr. Theodore P. Haas, Philadelphia College of Pharmacy and Science, Philadelphia 4, Pa.	1946
Louis E. Hand, 8061 Fairview St., Philadelphia 36, Pa.	1936
Miss Ann Harbison, "The Barclay", 18th St. & Rittenhouse Square, Philadelphia 3, Pa.	1944
James H. Hardy, 537 Country Club Lane, Havertown, Pa.	1947
Mrs. J. Norman Henry, Gladwyne, Pa.	1932
Miss Josephine DeN. Henry, Gladwyne, Pa.	1938
Lee P. Hynes, 36 West End Ave., Haddonfield, N. J.	1939
Miss Nancy E. James, 4043 Baltimore Ave., Philadelphia 4, Pa.	1942
Charles F. Jenkins, Kitchens Lane, Philadelphia 19, Pa.	1934
Prof. Marion A. Johnson, Dept. of Botany, Rutgers University, New Brunswick, N. J.	1946
Miss Natalie B. Kimber, 538 E. Locust Ave., Philadelphia 44, Pa.	1928
Rev. William U. Kistler, 118 Main St., Pennsburg, Pa.	1911
Dr. Henry A. Laessle, 5900 Market St., Philadelphia 39, Pa.	1894
Mrs. Ida K. Langman, 2316 Delancey Place, Philadelphia 3, Pa.	1937
Morris E. Leeds, 1025 Westview St., Philadelphia 19, Pa.	Founder
Dr. Harry A. Lloyd, 200 N. 35th St., Philadelphia 4, Pa.	1931
Bayard Long, 250 Ashbourne Road, Elkins Park, Philadelphia 17, Pa.	1906
John R. McIntosh, 304 Winona Ave., Philadelphia 44, Pa.	1945
Dr. Edwin T. Moul, Dept. of Botany, Rutgers University, New Brunswick, N. J.	1945
Mrs. George B. Orr, Willowbrook Farm, Paoli, Pa.	1935
Miss Elizabeth G. Ostheimer, Jenkintown, Pa.	1933
Dr. Samuel C. Palmer, 26th & Chestnut Sts., Chester, Pa.	1929
Dr. Ruth Patrick, Academy of Natural Sciences, Philadelphia 3, Pa.	1937
Dr. Francis W. Pennell, Moylan, Pa.	1910
Dr. Robert B. Platt, Dept. of Biology, Emory University, Ga.	1947
Dr. Richard W. Pohl, Dept. of Botany, Iowa State College, Ames, Iowa	1940
Harold W. Pretz, 123 S. 17th St., Allentown, Pa.	1909
George R. Proctor, 108 Atlas Drive, Collins Park, New Castle, Del.	1944
Miss Helen Ramsey, 1328 Jerome St., Philadelphia 40, Pa.	1945
Miss Anne Rowland, Meadowbrook, Pa.	1948
Mrs. Karl Rugart, 612 Bryn Mawr Ave., Penn Valley, Narberth, Pa.	1942
Dr. Ralph M. Sargent, 4 College Circle, Haverford, Pa.	1948
Dr. Robert L. Shaeffer, Jr., 32 N. 8th St., Allentown, Pa.	1938
Dr. J. R. Schramm, Dept. of Botany, University of Pennsylvania, Philadelphia 4, Pa.	1937
Henry Skinner, Morris Arboretum, Chestnut Hill, Philadelphia 18, Pa.	1942
Mr. & Mrs. Robert V. Speck, Apt. 117-B, Haddon Hills, Crystal Lake Ave., Haddonfield N.J.	1947
Leslie D. Stair, 141 Fern Ave., Collingswood, N. J.	1944
Dr. Walter Steckbeck, Dept. of Botany, University of Pennsylvania, Philadelphia 4, Pa.	1925
Dr. C. I. Stiteler, 507 Welsh St, Chester, Pa.	1945
F. Joseph Stokes, 1012 Westview St., Philadelphia 19, Pa.	1947
Mrs. F. Joseph Stokes, 1012 Westview St., Philadelphia 19, Pa.	1947
Hugh E. Stone, 431 Berkley Road, Haverford, Pa.	1892

Dr. Robert R. Tatnall, 236 Lancaster Ave., Wynnewood, Pa. 1928

Horace E. Thompson, 5016 Schuyler St., Philadelphia 44, Pa. 1920

Wm. Thompson, Jr., Leroy Court Apartments, #403, 1700 S. 60th St., Philadelphia 42, Pa. 1936

R. J. Titherington, 6317 N. Norwood St., Philadelphia 38, Pa. 1942

Harry W. Trudell, 303 Highland Ave., Abington, Pa. 1915

Dr. Paul R. Wagner, Ursinus College, Collegeville, Pa. 1935

Warren H. Wagner, Dept. of Botany, University of California, Berkeley, California ... 1942

E. Perot Walker, 511 Lynmere Road, Bryn Mawr, Pa. 1939

Mrs. Marguerite L. Warnke, 142 S. Logan Ave., Audubon, N. J. 1935

Miss Evelyn Wells, Biological Abstracts, University of Pennsylvania, Philadelphia 4, Pa. 1947

Robert F. Welsh, 325 Chestnut St., Philadelphia 6, Pa. 1909

Dr. Edgar T. Wherry, Dept. of Botany, University of Pennsylvania, Philadelphia 4, Pa. 1925

Hans Wilkens, 424 S. 15th St., Reading, Pa. 1928

William H. Witte, Riegelsville, Pa., R. D. 1898

Howard Wood, Jr., " Aloha ", R. D. 1, Conshohocken, Pa. 1944

Miss Mary F. Wright, 231 Winona Ave., Philadelphia 44, Pa. 1928

HONORARY MEMBERS

Charles M. B. Cadwalader, Academy of Natural Sciences, Philadelphia 3, Pa. 1944

Dr. Edward E. Wildman, 4331 Osage Ave., Philadelphia 4, Pa. 1931

CORRESPONDING MEMBERS

Dr. John H. Barnhart, New York Botanical Garden, New York, N. Y. 1936

Prof. M. L. Fernald, Gray Herbarium, Harvard University, Cambridge, Mass. 1929

Dr. Joseph S. Illick, State College of Forestry, Syracuse, N. Y. 1925

Dr. Hui-Lin Li, Dept. of Botany, National Taiwan University, Taipei, Taiwan, China .. 1944

Dr. Elmer D. Merrill, Arnold Arboretum, Jamaica Plain 30, Mass. 1945

Dr. Harold St. John, University of Hawaii, Honolulu, T. H. 1927

Dr. William Randolph Taylor, University of Michigan, Ann Arbor, Mich. 1921

Dr. Campbell E. Waters, Chevy Chase, Washington, D. C. 1904

Dr. Heber W. Youngken, Massachusetts College of Pharmacy, Boston, Mass. 1918

RECENTLY DECEASED MEMBERS

Died

Miss Marie Chillas, Active .... May 23, 1948

Lee Sowden, Active .... July 28, 1947

Index to Genera

Abama, 58; Abies, 58; Acacia, 11, 39; Acer, 73; Acerates, 44; Achillea, 25, 41; Adonis, 10; Aeschynomene, 25; Agrimonia, 39; Agrostis, 23, 39, 40, 44, 65; Aira, 23, 40, 41; Allionia, 41; Allium, 41; Amomum, 10; Amorpha, 25, 41; Ampelopsis, 10, 41; Amphicarpum, 56; Amphistelma, 13; Amsonia, 27; Anchusa, 41; Andromeda, 11, 25, 27, 41, 42; Andropogon, 24, 25, 42, 50, 64; Angelica, 42; Annona, 42; Anthoxanthum, 24, 25, 50; Aplectrum, 57; Arabidopsis, 43; Arabis, 42, 43; Arenaria, 43; Arethusa, 43; Argemone, 43; Aristida, 43, 45; Arsenococcus, 41; Arundinaria, 43; Arundo, 40, 43, 44; Asarum, 44; Asclepias, 13, 25, 44; Asemeia, 59; Aster, 11, 27, 44, 87; Atheropogon, 34; Atragene, 45; Aureolaria, 52; Avena, 45

Bartonia, 23, 25, 26, 34, 45; Batschia, 41; Beckmannia, 49; Benzoin, 54; Betula, 73; Bidens, 87; Blandfordia, 10; Blitum, 20; Boltonia, 45, 50; Bossiaea, 10; Brachyelytrum, 56; Brassica, 45; Bryanthus, 56; Bulbostylis, 49; Bumelia, 45; Bunias, 38

Caladium, 45; Calamagrostis, 40, 43, 44; Caltha, 22, 45; Campanula, 22, 45; Cantua, 45; Cardamine, 42; Carduus, 45, 46, 48; Carex, 13, 14, 46; Carpinus, 73; Carya, 54, 73; Cassia, 10, 11, 46; Castanea, 24; Ceanothus, 25, 27, 46; Celastrus, 10; Centaurella, 23, 26, 45; Cerastium, 24, 46, 47; Ceresia, 58; Ceropegia, 13; Cerothamnus, 56; Chamaecrista, 46; Chelone, 47; Chenopodium, 47; Chionanthus, 20; Chironia, 47; Chrysocoma, 47; Cimicifuga, 47; Circaea, 20; Cirsium, 45, 47, 48; Cladium, 62; Cladonia, 74-85; Claytonia, 47; Clematis, 10, 11, 45, 47; Cleome, 47; Cliftonia, 55; Clinopodium, 47; Cnicus, 25, 27, 45, 46, 47, 48; Convolvulus, 25; Conyza, 27, 48; Corydalis, 27, 48; Crataegus, 10, 48, 73; Cucubalus, 64; Cyclamen, 48; Cymbidium, 57; Cymophyllus, 46; Cynanchum, 13, 14, 48; Cynoctonum, 13, 57; Cyperus, 38, 48, 49, 62

Dalibarda, 49; Dasystephana, 52; Dentaria, 49; Desmanthus, 39; Desmodium, 53; Dianthera, 54; Diapedium, 54; Dicentra, 48, 73; Dichroma, 49; Digitaria, 49; Dilepyrum, 56; Diodia, 49; Dioscorea, 49; Diospyros, 49; Dolichos, 10, 49; Draba, 49; Drosera, 28

Echinochloa, 57; Edisonia, 48; Eleocharis, 62, 63; Eleusine, 49, 50; Elliottia, 34, 50; Ellisia, 53; Elymus, 50; Epipactis, 50; Eragrostis, 59; Erianthus, 24, 25, 50; Erigenia, 53; Erigeron, 25, 48, 50; Erinus, 50; Eryngium, 50; Erythronium, 38; Euonymus, 27, 51; Eupatorium, 87; Euphorbia, 51

Fagus, 51, 73; Festuca, 14, 38, 51, 59; Franklinia, 52, 69; Frasera, 26, 51; Fraxinus, 6, 51; Fumaria, 10

Galactia, 51; Galax, 10; Galearis, 57; Galeorchis, 57; Galium, 23, 24, 51; Gentiana, 10, 52; Gerardia, 13, 25, 52; Geum, 24; Gilia, 45; Glechoma, 52; Glycine, 10, 52; Gonolobus, 48; Gordonia, 52; Gratiola, 52; Gymnopogon, 42; Gyrophora, 9

Habenaria, 57; Hedysarum, 53; Helleborus, 53; Hemicarpha, 63; Heteranthera, 22, 53; Heteropogon, 64; Heuchera, 27, 53; Hibiscus, 10, 53; Hippuris, 20; Holcus, 53; Houstonia, 10, 11, 53; Hydrangea, 25; Hydrocharis, 53; Hydrocotyle, 53; Hydrophyllum, 53; Hypericum, 10, 25, 53, 54; Hypnum, 9

Ilex, 60; Impatiens, 24; Inula, 10, 11, 25; Isolepis, 63; Ixia, 54

Juglans, 6, 10, 54; Juncus, 54; Justicia, 27, 54

Knowltonia, 10; Kyllinga, 54

Lactuca, 54; Lathyrus, 38, 54; Laurus, 10, 25, 27, 54; Lecanora, 9; Lecidea, 9; Ledum, 11, 54; Lemna, 72-73; Leptanthus, 53; Leptochloa, 50, 51; Leptoloma, 57; Leucothoe, 42; Lichen, 9; Lilium, 11, 71-72, 87; Limnobium, 53; Limodorum, 55; Lindera, 54; Lindernia, 55; Linum, 27, 55; Lobelia, 10, 55; Lonicera, 55; Lygodesmia, 60; Lyonia, 13, 14, 41, 55; Lythrum, 10, 11

Macbridea, 65; Malva, 55; Mariscus, 62; Marshallia, 27, 55; Mecardonia, 52; Melampyrum, 56; Melananthera, 56; Melanthium, 10; Melica, 56; Menispermum, 56, 73; Menziesia, 10, 11, 56; Mertensia, 73; Mespilus, 10, 48; Metastelma, 13; Mikania, 56; Milium, 56; Mimosa, 10, 11, 39; Mimulus, 87; Monotropa, 56; Muhlenbergia, 34, 40, 56, 59; Myrica, 56; Myrrhis, 62

Narthecium, 58; Nemophila, 53; Neottia, 38; Nepeta, 52; Nicotiana, 10; Nycterium, 10

Oenanthe, 56; Ophiorrhiza, 57; Ophrys, 10, 50, 57; Orchis, 38, 55, 57; Oryzopsis, 57; Osmorhiza, 62; Oxypolis, 56

Pagesia, 52; Panax, 73; Pancratium, 10, 11; Panicum, 14, 49, 57, 58; Parmelia, 9; Paspalum, 13, 56, 58; Pastinaca, 58; Pedicularis, 58; Peltandra, 45; Persoonia, 55; Phaca, 25; Phacelia, 27, 58; Phalanguim, 58; Phalaris, 49; Phaseolus, 49, 58; Philadelphus, 58; Phlox, 10, 58; Phyllanthus, 58; Picea, 58; Pieris, 41; Pinus, 58; Plantago, 25, 58; Platanus, 73; Platylobium, 10; Pluchea, 48; Poa, 14, 58, 59; Podalyria, 10, 11, 59; Polemonium, 25; Polygala, 59; Polygonum, 59; Polypodium, 28; Pontederia, 59; Ponthieva, 50; Porina, 9; Potamogeton, 59, 60; Prenanthes, 25, 60; Prinos, 10, 27, 60; Proserpinaca, 73; Protea, 10; Prunus, 11, 27, 60; Psoralea, 60; Pulmonaria, 10, 11, 60; Pyrus, 10, 60

Quercus, 6, 10, 60, 73

Ranunculus, 60, 61; Rhamnus, 61; Rhododendron, 61; Rhus, 25; Rhynchospora, 62; Ribes, 61; Rosa, 10, 11, 25, 61; Rubus, 10, 61; Rudbeckia, 10, 11, 61; Rumex, 38, 61

Sabatia, 47; Sabulina, 43; Sagittaria, 28, 61, 62; Salicornia, 38; Salix, 6, 62; Sambucus, 62; Santolina, 62; Sarracenia, 10; Saxifraga, 11; Scandix, 62; Schizaea, 39; Schoenus, 13, 62; Scirpus, 13, 28, 49, 62, 63; Scleria, 63; Scutellaria, 10, 42, 63; Senecio, 63; Sesban, 64; Sesbania, 25, 63; Seutera, 13, 14; Silene, 64; Silphium, 10, 11, 64; Sisymbrium, 43; Sium, 64; Solanum, 10, 64; Solidago, 64; Spartina, 64; Sphenopholis, 40, 41; Spiraea, 13, 26, 27, 64; Spirodela, 73; Sporolobus, 40; Stanleya, 45; Staphylea, 73; Stellaria, 43; Stipa, 40, 64; Streptanthus, 45; Symplocos, 22, 64

Taxus, 64; Thalia, 22, 64; Thalictrum, 24, 64; Thymbra, 65; Thymus, 10; Tiarella, 70; Tilia, 65; Tipularia, 55; Trautvetteria, 64; Trichodium, 40, 65; Trifolium, 10, 65; Trillium, 71; Triplasis, 51

Ulmus, 36, 65; Uraspermum, 38; Usnea, 9; Utricularia, 38, 73, 87

Vaccinium, 10, 11, 41, 65; Verbena, 25, 65; Veronica, 10, 20; Viburnum, 10, 11, 65; Vicia, 65; Vigna, 49; Vincetoxicum, 14; Viola, 10, 11, 65; Viorna, 47; Virgilia, 66; Vitis, 11, 27, 66

Waldsteinia, 49; Warea, 47

Xanthoxylum, 38; Xylosteum, 55

Yucca, 22, 66

Zapania, 25; Zingiber, 10

A-f 73

No. 26 1952

BARTONIA

JOURNAL OF THE PHILADELPHIA BOTANICAL CLUB

CONTENTS

Memorial Meeting for Dr. Francis W. Pennell, February 28, 1952 1
MARY G. HENRY, HUGH E. STONE, H. A. PILSBRY, CYRIL HARVEY, HARRY W. TRUDELL, DAVID D. KECK, A. C. SMITH, MAXIMINO MARTINEZ, E. T. WHERRY.

Writings of Francis W. Pennell ....VENIA T. PHILLIPS and JOSEPH A. EWAN 12

Obituaries: Francis W. Pennell, Morris E. Leeds ....WALTER M. BENNER 16

The Pine Barrens of New Jersey

Introduction ....JOHN A. SMALL 19

What Can be Inferred from Pollen Profiles of Bogs ....J. E. POTZGER 20

Soil Conditions in the Pine Barrens ....J. C. F. TEDROW 28

Ground Water in the Pine Barrens Area ....HENRY C. BARKSDALE 36

The Place of Fire in the Ecology of Pines ....H. H. CHAPMAN 39

Silvicultural Objectives and Methods on Upland Sites ....S. LITTLE 44

Controlled Burning—Ecological Aspects ....J. E. CANTLON and M. F. BUELL 48

Future of the Pine Barrens ....CARL B. CRANMER 53

Programs and lists of members 61

PUBLISHED BY THE CLUB
ACADEMY OF NATURAL SCIENCES, NINETEENTH AND THE PARKWAY
PHILADELPHIA
ISSUED DECEMBER 22, 1952

BARTONIA

Journal of the Philadelphia Botanical Club

Devoted primarily to the flora of the mid-eastern United States, especially of eastern Pennsylvania, New Jersey and Delaware.

Subscription Price, $1.00. Back numbers, $1.00 each.

EDGAR T. WHERRY,
Acting Editor, 1952

**Academy of Natural Sciences, Nineteenth and the Parkway,
Philadelphia 3, Pa.**

Plate 1. Francis Whittier Pennell, 1886–1952.

BARTONIA

JOURNAL OF THE PHILADELPHIA BOTANICAL CLUB

No. 26 1952

Memorial Meeting for Dr. Francis W. Pennell

February 28, 1952

This meeting of the Philadelphia Botanical Club in memory of Dr. Pennell is held to honor his name and so that we may hear from some of his fellow workers about the various phases of his scientific accomplishments.

There are many here who knew Dr. Pennell longer than I did, but my association with him extended over twenty years. I admired immensely his vast store of knowledge, appreciated his warm friendship and his unfailing kindness and courtesy.—MARY G. HENRY, *Vice-President.*

The death of Dr. Pennell has taken from the Academy and from all of us present a valued friend and leader. His lifework in botany is far above my ability to comment upon, but his work as a friend and adviser was outstanding.

I have gone to him many times for help and advice during our years of acquaintance and he was always so kind, so cordial. He personified the true spirit of the Academy in his unselfish efforts to guide and encourage. So many times I have interrupted his work for help to look up a specimen—a reference; many times we lunched together, went on trips to woods and barrens of nearby counties and New Jersey. My file of Bartonias is filled with articles of interest—scientific and historical—which he contributed and I value the pamphlets and other literature which he passed along to me through the years. His influence has done much for the success of this club which has grown in efficiency, as a club, since the early 1890's when I was first a member.

In those old days of the founders—a bunch of good fellows—we would get together here, talk informally, show a few specimens, discuss past trips, plan others—there seemed to be little preparation for the meetings. There is no criticism possible of the wonderful work those older botanists did personally and the evenings together were delightful, but as a club meeting there seemed to be a lack of the planning which we now enjoy.

In memory of Dr. Pennell's efforts for our club and his interest in its success, let us carry on the work in a way which he would approve and try to use some of his persuasive influence and enthusiasm to enlarge and improve its work.—HUGH E. STONE.

Though my acquaintance with Dr. Pennell dates back to about 1910, I did not know him well until we spent the summer of 1934 and 1935 together in Mexico, collecting plants and snails, and again in Peru in the winter of 1948-9.

It is a good test of the qualities of a companion to share months afield, usually in rough country, and occasionally in conditions of some hardship. In a long life I have had few field companions equal to Pennell. He was even-tempered, his equanimity not disturbed by bad luck. If nightfall found us far from camp, the long trudge would be shortened by his interesting talk. Sometimes if I would quote a line or two from a poem, he would take it up there and finish it. He had an unusual memory for poetry and history as well as for plant taxonomy.

His working knowledge of colloquial Spanish often stood us in good stead. In some Indian village where an inquiry would loose a flood of Spanish with such a Quechua accent that I could scarcely get a word, Francis generally understood the gist of it and got the information needed.

Nothing was allowed to interfere with the gathering of specimens. Travelling by jeep in Peru, where it is often a long distance between towns where an American can find tolerable accommodations, Francis would often call to the driver, " Uno momentico ", hop out before the car had stopped, to get some Calceolarias that caught his eye. Then sit by the roadside to put them carefully into the plant press. Of course there were stops also where it looked good for land mollusks, so we usually reached the destination planned some hours later than we intended. Finally we would get some food and get settled, several times in a room with a door on the street and no windows. By candle light the daily chore of changing dryers on the plants and preparing snails would then go on, the door open for air, but crowded with chattering children watching the crazy North Americans. When the collecting had been heavy, it was sometimes well past midnight when the last dryers were changed.

Pennell's hardest trip was in northeastern Peru in company with a Peruvian botanist. I was not with him, having gone to the Cuzco region. On his return Francis really looked ill. His weight had fallen 16 pounds; but a week in Lima, with rest and good food, brought him back to his usual form, and he was delighted with the Calceolarias he had gathered, in spite of heavy rain and terrible roads.

It is a great loss to science that he did not live to work up his huge Peruvian and Mexican collections. As a scholarly, erudite and tireless worker, he will be sadly missed by the Academy staff. Those of us who have had the good fortune to work with him in the field, feel that this staunch, generous and companionable spirit cannot be replaced in our lives.—H. A. PILSBRY.

Thinking over our two trips to Mexico, in 1934 and 1935, I shall jot down between classes some impressions of Francis Pennell.

First, he was an indefatigable, meticulous explorer in the unknown realms of botanical implications. He often worked the clock around, collecting all he could in daylight hours, only to change blotters all night to insure against mildew.

At the time of collecting, in spite of weather, comfort or time hazards, he insisted on statistics on the spot, e. g. barometric reading, temperature, soil, accurate geographic location, etc. There was only one way to collect: the right way to acquire all knowledge possible.

At mealtime or bedtime we would frequently ponder such problems as relation of lime concentration to the needs of his pet plant group, " the Scrofs ", or the mechanism of evolution of flower structure or color in relation to the interest of bees or humming birds.

He never wasted time. On the way to a given area he perused maps so that he needed nothing but his photographic memory while on the job.

He knew his ecology so well that random treasure-hunting would have been boring as well as a waste of time. He would look over a habitat and read off a list of plants we would soon find—even *NEW* ones.

He was patient with plants, people and plain forces in the world. He accepted what had to be cheerfully and when people or animals were involved, kindly.

In Durango he carried on vivacious interesting conversation with a telegraph operator who was 45 minutes late from his noon siesta, although Francis knew he would be up 45 minutes later with necessary blotter changing that night as a result of the wasted time.

Although his love for " pure science " was strong and the acquiring of money a necessary side interest, he was scrupulous in keeping to a budget day by day on a trip. He looked upon trip monies as a definite trust. He even hesitated to " pad the expense account " with afternoon snacks or sundaes.

Having been interested in the field of botany at a tender age, he was eager to expose the lures of the field to as many children as possible. He took Friends' Central Junior High classes through his department every year for 15 years. He always had time to explain the wonders of plant life to curious young folks, especially when in the field.

He was more than a scientist, he was a real lover of man. On our expeditions we adjusted our tempo, whenever he thought it wise, to the Mexican way. We were encouraged to be Mexican while in Mexico. We ate their food, slept in their hotels and attended masses, weddings and funerals. We also visited schools. Although a pacifist himself, he maintained warm, friendly relations with the military on more than one occasion. Because of his beautiful Castilian Spanish, and gentle understanding spirit, he was an excellent public relations man for Quakers, the Academy and the U. S. A.—CYRIL HARVEY.

I have been actively associated with Dr. Pennell since February 1949. Helping in the Academy Herbarium to distribute new accessions to the collection, and returning to their places sheets that had been sent out to other institutions.

At that time Dr. Pennell had been much distressed by the accumulations of unfiled specimens which in that condition were of little value for interested persons. He was very busy on other tasks and could not get around to doing any of this work himself. Dr. and Mrs. Robert Speck had volunteered their services and also the late Mr. Stair of our Club, had put in some time on this work. I arranged to devote at least one day each week and from the beginning found it very agreeable and pleasant working with Dr. Pennell and it was seldom that he failed to thank me for coming in, upon my arrival as well as when we parted for the day. The work became monotonous but in view of his continued gratitude and apparent pleasure I continued the service.

When I found myself up against some technical difficulty or question, he was most prompt and painstaking to " put me on the right track ". He was ever patient and I do not remember a single incident where he made an unkind criticism of any one and there were instances where he would have been fully justified in doing so. I found myself frequently benefited from his excellent knowledge of Latin.

The three years of association with him has been most pleasant and profitable to me and has deepened my regard and admiration for the principles of the Quaker faith as practiced by him whom we hereby recall a kindly and outstanding gentleman.—Harry W. Trudell.

Francis Whittier Pennell—Authority on the Scrophulariaceae

Dr. Pennell was one of America's foremost plant taxonomists. A brief historical sketch of the taxonomic field as a whole may be useful in showing where his contribution fits into the larger picture.

The progress of plant taxonomy has been remarkably rapid since the time two centuries ago when Carolus Linnaeus started it off on a modern footing. The task of systematizing our knowledge about the kinds of vegetation that cloak the earth has been formidable indeed. If there are some 200,000 species of flowering plants alone, as is currently believed, it is obvious that the task of presenting an orderly arrangement of them is a job for specialists.

The Swiss botanist, Augustin Pyrame de Candolle, organized and initiated the last complete flora that attempted to classify and describe every species of seed plant then known. He brought forth the first 7 volumes of this work, the *Prodromus*, through his own efforts, while the last 10 were written by others and published after his death. The entire undertaking took the half century from 1824-1873 to bring to print. De Candolle had the advantage that most of the known species were represented in herbaria fairly accessible to him.

Bentham and Hooker, writing their monumental new system of classification in a 3-volume work entitled *Genera Plantarum* in the latter part of this period, likewise were able to bring under their personal gaze examples of the majority of known kinds of seed plants. A man of comparable energy to these giants in the history of plant classification was the German botanist, Adolph Engler. He succeeded in guiding to completion *Die natürlichen Pflanzenfamilien* (1887-1899), a work written by numerous collaborators, by means of which the known genera of all plants, cryptogams and phanerogams alike, could be identified. But his monographic treatment of the species of seed plants, *Das Pflanzenreich*, proved to be too large an undertaking for the present century even though the help of innumerable specialists was solicited and many thousands of pages of valuable taxonomic product were gathered into the more than 100 parts that were published in the half century until World War II finally brought it to a halt, far from completion. By this time the literature and the collections of systematic botany had become so widely distributed over the earth that it was exceedingly difficult to gather the data together in order to present a fresh treatment of so large a scope from a world point of view. Monographic work on smaller parts of the plant kingdom has become the modern aim.

The total number of monographers in the botanical field has never been large. As a result, each worker is constantly faced with demands upon his time that call for more commitments than he can hope to fulfill conscientiously. Many taxonomists do their best work under the stimulus of their association with members of first one family of plants and then another. Others have found it more profitable to learn more and more about a few plant families or even a single one. These people have found no lack of problems to engross them, and there is an additional advantage: As one becomes known as *the authority* on a group, the mailman beats a path to his door with successions of packages containing often the choicest selections of specimens in his chosen field that are sent him for identification from all quarters of the globe. This flood of material enriches the study collections available to him to the point where his facilities for naming plants of the group are keeping abreast of the superior knowledge he is gaining of their classification, until the point is soon reached where his colleagues automatically turn to him almost alone for help with the identification of critical collections in his chosen field.

Francis Whittier Pennell was such a specialist in the Scrophulariaceae, a family in which are found many of our garden favorites, such as the snapdragons, linarias, foxgloves, penstemons, and calceolarias, and larger numbers of some of our most interesting genera of wildflowers, such as the paintbrushes, veronicas, pedicularises, monkey-flowers and gerardias. Pennell worked devotedly and almost exclusively on this family for a third of a century. Truly he loved it! He felt that for himself this family indeed was the most fascinating of all. He took particular delight in tracing out possible evolutionary trends in this family where modifications of the flowers are profound. To the connection between such modifications and the insect visitors which effect pollination of the species he gave constant attention, and in this point of view he received much inspiration from the comprehensive work of Robertson on the subject.

Dr. Pennell's maturing philosophy on the relationships within the family Scrophulariaceae found its most complete expression in his well-known classic monograph published by the Academy in 1935, *The Scrophulariaceae of Eastern Temperate North America.* While this work treated of the genera of Scrophulariaceae limited to one geographic area, Pennell brought forth an improved arrangement of the tribes and genera in the family that has been favorably received. With clear logic he has pointed out the weaknesses of the older classification and presented convincing evidence for his proposal, among others, that the tribe Gratioleae is to be considered more primitive than the Digitaleae which was previously considered to be in that position.

It is a great pity that the companion volume to this one, the proposed work on the *Scrophulariaceae of Western Temperate North America*, remains incomplete. In it we should have had on record Pennell's ideas on the relationships between and within the genera that most caught his fancy—*Penstemon, Castilleja, Mimulus* and *Pedicularis.*

It is to be hoped that this manuscript, with its very excellent series of illustrations which were being prepared for him by the artist who drew the family for Abrams' Illustrated Flora of the Pacific States, Mrs. Janish, is well enough advanced so that it can be brought to publication. I think Dr. Pennell considered it his magnum opus. Suffice it to say that it would have been a thoroughly fine monument to the industry of one man who was in the very forefront of his field, because his talents and training, together with a keen perception engendered by a real love for the task, put him there.

Very fortunately he was diverted long enough from this task to prepare the account of most of the family for Abrams' Flora mentioned above, and one can learn from that comprehensive treatment something of the way the final treatment would have developed.

This note of mine was planned to cover some of the taxonomic aspects of Dr. Pennell's contributions, but I must add that his strength as a taxonomist lay in no small part in his combination of solid research in the herbarium and a broad knowledge of the plants in the field. I had a long and heavy correspondence with him on the genus Penstemon. One debate concerned the merits of certain species of the Pacific Northwest which I had studied in the field and he had not. But no sooner did Dr. Pennell see these species growing, than he and I reached agreement on the question. Dr. Pennell was firm when he needed to be firm, but he had a sense of humility that not only permitted, but demanded, a correction of viewpoint when new evidence pointed out its desirability. This characteristic was one of many marks of greatness in the man. His friends everywhere know that his passing has left a gap in the ranks of plant taxonomists that will be most difficult to fill.—DAVID D. KECK.

Dr. Francis W. Pennell's Botanical Work in South America

Members of the Philadelphia Botanical Club and other botanists whose primary interests are in North America, are principally acquainted with Dr. Pennell's work through his meticulous papers dealing with North American Scrophulariaceae, or perhaps through his collections from the United States and Mexico, or through his consuming interest in botanical history, especially as it pertains to the Philadelphia region. However, among taxonomists who work with South American plants, Dr. Pennell's first claim to preëminence is based upon his invaluable Andean collections and his studies of one of the most difficult tropical plant families.

It was not until 1917 that Dr. Pennell, then in his thirty-first year, received his first glimpse of tropical vegetation. So firmly is Pennell fixed in our minds as a part of the Philadelphia Academy that we forget the formative period he spent, from 1914 to 1921, as a staff member of the New York Botanical Garden. Here he must have received both instruction and inspiration from such leaders of American taxonomy as Britton, Small, Rydberg, Howe, Seaver, and Barnhart, and it was doubtless Britton's increasing concern with tropical floras that led to Pennell's first trip to Colombia. This was made in company with Britton's friend and collaborator, H. H. Rusby, whose position as an eminent pharmacologist did not dim his enthusiasm for tropical taxonomic study.

It is characteristic of Pennell's already developed preoccupation with the Scrophulariaceae that the first three tropical plants he deemed worthy of note, in his report to Britton, represented the genera *Buchnera*, *Capraria*, and *Scoparia*. On this first Colombian trip, Pennell, either in company with Rusby or alone, visited all three Cordilleras and ascended numerous mountains to investigate the paramo vegetation, which immediately fascinated him. The trip resulted in the collection of 4700 numbers, of which duplicates have been distributed to many herbaria.

The success of the Rusby-Pennell trip led to the elaboration of a program for the botanical exploration of northern South America that involved active collaboration between the New York Botanical Garden, the Gray Herbarium, the Smithsonian Institution, and later the Philadelphia Academy, a program that has greatly broadened our knowledge of the region. One of the first results of this collaboration was the Colombian expedition of 1922, during which Pennell, in company with E. P. Killip and T. E. Hazen, assembled about 7200 numbers of herbarium specimens with ample duplicates for each of the contributing institutions. On this trip the botanists again visited all three Cordilleras, concentrating on the rich Cauca Valley area and the adjacent highlands.

His studies of the Scrophulariaceae led Pennell to look farther south, where the family is perhaps even better developed than it is in Colombia. His trip of 1925 took him to the central and southern Departments of Peru and to Chile; to support this trip the Field Museum (now the Chicago Natural History

Museum) was also drawn into the inter-institutional cooperative scheme. Following the Peruvian trip, Pennell turned his field efforts again to the United States and Mexico, but his interest in the southern continent was unflagging and he gave ready attention to the specimens which other collectors sent him for identification. A final South American trip, in 1948, again took him to Peru, this time in search of critical specimens that would permit the completion of one of his cherished projects, a revision of all the Scrophulariaceae of the Andean countries. It was a source of great satisfaction to his many botanical friends, as to Pennell himself, that a substantial part of this work was carried through to publication at the end of 1951, when his penetrating and comprehensive study of *Calceolaria* in the north Andean countries was printed.

During his four South American trips, Pennell prepared many thousands of herbarium specimens that are unexcelled representations of a rich and varied flora. The patient and competent manner that he brought to every botanical problem is shown in the high quality of his specimens and field notes. His earlier trips, it must be recalled, were made before roads had penetrated far into the rugged Andean country, and during the long trips by mule or on foot, Pennell showed a serene determination to reach botanically unknown areas. It is a matter of regret that he has not left more accounts of his Andean trips in the vein of his charming description of the Páramo de Chaquiro in northern Colombia. One suspects that the lure of new or rare scrophulariaceous plants was the magnet that drew him up to the alpine meadows in so many parts of the Andes.

However, Pennell's collections were not slanted toward his " scrophs " to the exclusion of other groups. He had an uncanny ability in his South American collecting to obtain unusual specimens in every family, perhaps because he so assiduously visited out-of-the-way localities regardless of the effort involved. Every sizable group of Andean plants has been better comprehended, if not increased, by Pennell's material. If I may give an example from my own studies, Pennell, either alone or in collaboration, collected 98 Colombian numbers of a tribe of Vacciniaceae that I revised in 1932. Of these 98 specimens, 20 served as types of new species, and several of the remainder also represented novelties but were not selected as types. I do not imply that Pennell neglected to collect common and widespread species as well, but he definitely avoided " running up numbers " by indiscriminate repetition. In every respect his Andean collections are models of what a monographer desires when engaged in the " alpha " taxonomic studies that are still essential in South America.

Dr. Pennell's death, at a time when his long study of South American Scrophulariaceae was beginning to bear fruit in publication, is a serious loss to our science; his place as a specialist in this complicated group of plants cannot be filled. The even more severe loss of a good friend and valued counselor is felt not only by the members of this Philadelphia Botanical Club, but by the fraternity of plant taxonomists throughout the world.—A. C. SMITH.

REFERENCES

PENNELL, FRANCIS W. A botanical expedition to Colombia. Jour. N. Y. Bot. Gar. 19: 117-138. Pls. 213, 214. 1918.

————. To the Páramo de Chaquiro. Amer. Fern Jour. 33: 81-96. Pl. 1. 1943.

————. The genus Calceolaria in Ecuador, Colombia and Venezuela. Proc. Acad. Nat. Sci. Phila. 103: 85-196. Figs. 1-33; pls. 6, 7. 1951.

KILLIP, E. P. Botanical exploration in Colombia. Smithsonian Miscel. Collections 74(5): 70-79. Figs. 70-81. 1923.

————. Botanical exploration in South America. Smithsonian Sci. Series 11: 353-377. Pls. 87-97. 1931.

Es de veras lamentable le muerte del Dr. Pennell. Siempre es muy dificil y casi imposible llenar el lugar de un especialista. Es una gran perdida para la ciencia botanica.[1] — PROF. MAXIMINO MARTINEZ, Secretary of the Botanical Society of Mexico.

---

[1] The death of Dr. Pennell is truly to be lamented. It is always difficult, almost impossible, to fill the place of a specialist. Botanical science has suffered a great loss.

A Last Wish Concerning the Scrophulariaceae

The plant family *Scrophulariaceae* to which our late President devoted his scientific life, is a large and complex one. The broad outlines of its division into subgenera, sections, tribes, etc. were worked out by George Bentham in the 1840's before Darwin directed the attention of taxonomists to the significance of the evolutionary viewpoint. Bentham had available only a limited number of specimens, and scanty information as to the geographic distribution of the members of the family, and deserves much credit for his success in bringing its taxonomy into a reasonably logical system. Indeed, the conservative Asa Gray in the 1870's and Richard von Wettstein in the 1890's did not introduce any essential changes in the Bentham scheme.

Upon taking up the detailed study of this family in the 1900's, Dr. Pennell had the advantages of access to copious material in the vast modern herbaria, of field acquaintance with many of the taxa in the New World, and of appreciation of the fundamental importance of the evolutionary approach to taxonomic problems. He early realized the need for a thoroughgoing revision of the classification of the groups within the family, and did succeed in making a start in this direction. On more than one occasion he confided to me that he hoped to crown his career by carrying this plan to completion, a hope that alas was not to be fulfilled.

One of Dr. Pennell's more important contributions consisted in the straightening out of the taxonomy of the Tribe *Buchnereae,* which included also what

Bentham had classed as a distinct tribe, *Gerardieae.* Since he discussed with me the problems involved on various occasions, I am offering here some notes upon them.

Confusion in both nomenclature and taxonomy has unfortunately affected the members of this tribe from the earliest days. In 1703 Plumier coined the genus epithet *Gerardia* in honor of the famous John Gerarde, to apply to a tropical American member of the family *Acanthaceae.* In 1753 Linnaeus took up this genus, naming Plumier's species *Gerardia tuberosa,* and in the fifth edition of his Genera Plantarum, published the following year, he gave the features of that species as typifying the genus itself.

Unfortunately, however, Linnaeus mistakenly included in the same genus a *Gerardia purpurea,* based on a North American plant which we now realize belongs to a different family. Then when Bentham had to make a choice, he, for reasons difficult to understand, discarded the Plumier-Linnaeus interpretation of the genus *Gerardia,* and applied this epithet to the North American member of the *Scrophulariaceae* which Linnaeus had added by mistake.

The late Dr. John K. Small, who believed that nomenclatorial rules should not be allowed to perpetuate gross errors, refused to accept this procedure on the part of Bentham and his followers and in his Manual of the Southeastern Flora returned to the original Linnaean interpretation of *Gerardia* as a tropical member of the *Acanthaceae.*

On the other hand, two English workers, Hitchcock and Green, in the course of selecting what they considered " Standard species for Linnaean genera " reaffirmed Bentham's erroneous viewpoint, and made *Gerardia purpurea* typify the genus.

In Dr. Pennell's earlier writings on this series of plants, he was impressed by the insight shown as to their relationships by that erratic genius Rafinesque. The latter had clearly distinguished a group with narrow leaves and purple flowers as the genus *Agalinis,* and one with broader leaves and yellow flowers as *Aureolaria,* and these were treated as distinct genera in Pennell's thesis on *Agalinis* and Allies in North America, published in the Proceedings of the Academy of Natural Sciences in 1928 and 1929. In preparing the manuscript of his Monograph, *Scrophulariaceae* of Eastern Temperate North America, he naturally retained these genera; but feeling that the dicta of Hitchcock and Green should be accepted, he changed the name of *Agalinis* back to *Gerardia,* though recording that he did so " under protest ".

Dr. Pennell's careful study of evolution in relation to geography in this series had shown convincingly that the purple-flowered "American Foxgloves " originated far down in South America, and migrated into our eastern seaboard region by way of Mexico. On the other hand the yellow-flowered ones represent an ancient group of the Appalachian plant refuge. The two are thus not at all closely related, their general similarity in flower shape being the result of parallel evolution.

A great disappointment to him was the treatment of these plants in the 8th edition of Gray's Manual: Ignoring all the cumulative research of half a century, Fernald there lumped together these and other more or less unrelated taxa with the mere statement that he was returning to the generic concept of Bentham and others. This ultra-reactionary procedure, because of the way in which many workers turn to " The Manual " as authoritative, will seriously delay the working out of the real inter-relationships in the group. One of the last subjects I discussed with Dr. Pennell, three days before his death, was whether, in the Flora of Pennsylvania, which is now in preparation, it might not be possible to deviate from the Manual treatment. In so far as I have any say in the matter, his desires will be put into effect.—EDGAR T. WHERRY.

In closing the meeting, I will remark that the Philadelphia Botanical Club is extremely grateful to those who have made addresses and read letters this evening, and I feel sure we will always remember this meeting dedicated to a very great botanist, whose name will live always.

MARY G. HENRY, Vice-President.

Resolution on Dr. Francis W. Pennell

At a meeting of the Philadelphia Botanical Club, held at the Academy of Natural Sciences of Philadelphia, February 28th, 1952, the following Resolution was unanimously adopted and ordered to be spread on the minutes, a copy being duly forwarded to Mrs. Pennell.

RESOLVED, that in view of the death of Dr. Francis W. Pennell on February 3, 1952, the members of this club express their profound sorrow for his loss, and deep appreciation for his many years of service.

Dr. Pennell first joined the club in 1910, and served as its President from 1942 till the time of his death.

He was Editor of Bartonia since 1924.

Since 1921 he was Curator of Botany at the Academy of Natural Sciences of Philadelphia.

He travelled extensively in North and South America, collecting material with especial attention to the Scrophulariaceae, in which group he was considered the world's leading authority.

Besides being an eminent scholar in his specialty, we remember Dr. Pennell for his genial and kindly personality and for his willingness to advise and help his colleagues in any problems that they brought to his attention. His enthusiasm was an inspiration to all.

Writings of Francis Whittier Pennell

COMPILED BY VENIA T. PHILLIPS AND JOSEPH A. EWAN

1909 Some additions to Dr. Fussell's List of Delaware County Plants. Proc. Delaware County Inst. Sci., v. 4, pp. 68-74.

1910–11 Flora of the Conowingo barrens of southeastern Pennsylvania. Proc. Acad. Nat. Sci. Phila., v. 62, pp. 541-584.

1911 A new *Gerardia* from New Jersey. Torreya, v. 11, pp. 15-16.

—— Some records from the Potomac district. Torreya, v. 11, pp. 130-131.

1913 *Asplenium angustifolium* in Louisiana. Amer. Fern Jour., v. 3, pp. 16-17.

—— Further notes on the flora of the Conowingo or Serpentine barrens of southeastern Pennsylvania. Proc. Acad. Nat. Sci. Phila., v. 64, 1912-13, pp. 520-539.

—— Studies in the Agalinanae, a subtribe of the Rhinanthaceae. Bull. Torrey Bot. Club, vol. 40, pp. 119-130, 401-439.

1916 *Commelina communis*, Asiatic day-flower. Addisonia, v. 1, no. 2, pp. 39-40, col. pl.

—— *Dasystephana porphyrio*, pine-barren gentian. Addisonia, v. 1, no. 4, pp. 69-70, col. pl.

—— Notes on plants of the southern United States—I. Bull. Torrey Bot. Club, v. 43, pp. 93-111.

—— Notes on plants of the southern United States—II. Bull. Torrey Bot. Club, v. 43, pp. 407-421.

—— Report on a collecting trip to the central Rocky Mountain region. Jour. New York Bot. Garden, v. 17, pp. 1-6.

1917 Notes on plants of the southern United States—III. Bull. Torrey Bot. Club, v. 44, pp. 337-362.

1918 A botanical expedition to Colombia. Jour. New York Bot. Garden, v. 19, pp. 117-138, 2 pls.

—— Corrections of names of Colombian plants. Jour. New York Bot. Garden, v. 19, p. 319.

—— The flower of *Agalinis*—a correction. Rhodora, v. 20, pp. 199-200.

—— Notes on plants of the southern United States—IV. Bull. Torrey Bot. Club, v. 45, pp. 477-482.

—— A plea for *Aureolaria*. Rhodora, v. 20, pp. 133-137.

—— *Symphoricarpos Symphoricarpos*. Coral-berry. Addisonia, v. 3, no. 4, pp. 61-62, col. pl.

1919 A brief conspectus of the species of *Kneiffia*, with the characterization of a new allied genus. Bull. Torrey Bot. Club, v. 46, pp. 363-373.

—— Concerning duplicate types. Torreya, v. 19, pp. 13-14.

—— *Eysenhardtia*. North American Flora, v. 24, pp. 34-40.

—— *Fagelia diversifolia*. Cut-leaved slipperwort. Addisonia, v. 4, no. 4, pp. 73-74, col. pl.

—— Notes on plants of the southern United States—V. Bull. Torrey Bot. Club, v. 46, pp. 183-187.

—— *Penstemon calycosus*. Long-sepaled beard-tongue. Addisonia, v. 4, no. 2, pp. 31-32, col. pl.

—— *Penstemon tenuiflorus*. Slender-flowered white beard-tongue. Addisonia, v. 4, no. 4, pp. 79-80, col. pl.

—— Some books from Colombia. Jour. New York Bot. Garden, v. 20, pp. 7-10.

—— Some remarks upon *Limosella*. Torreya, v. 19, pp. 30-32.

1919-20 Scrophulariaceae of the local flora, I-V. Torreya, v. 19, pp. 107-119, 143-152, 161-171, 205-216, 235-242.

1920 Scrophulariaceae of Colombia—I. Proc. Acad. Nat. Sci. Phila., v. 72, pp. 136-188.

—— Scrophulariaceae of the central Rocky Mountain states. Contr. U. S. Nat. Herbarium, v. 20, pp. 313-381, vii-viii.

—— Scrophulariaceae of the southeastern United States. Proc. Acad. Nat. Sci. Phila., v. 71, pp. 224-291.

—— Soil preferences of Scrophulariaceae. Torreya, v. 20, pp. 10-11.

1921 *Penstemon secundiflorus*. Lavender-pink beard-tongue. Addisonia, v. 5, no. 4, pp. 53-54, col. pl.

—— "Unrecorded" genera of Rafinesque—I. Autikon botanikon (1840). Bull. Torrey Bot. Club, v. 48, pp. 89-96.

—— "Veronica" in North and South America. Rhodora, v. 23, pp. 1-22, 29-41.

1922	Scrophulariaceae of the west Gulf States. Proc. Acad. Nat. Sci. Phila., v. 73, 1921, pp. 459-536.
——	Some overlooked Scrophulariaceae of Rafinesque. Torreya, v. 22, pp. 77-84.
——	Plant nomenclature. Jour. Bot., v. 60, pp. 112-118.
1923	Scrophulariaceae of Cuba. Proc. Acad. Nat. Sci. Phila., v. 75, pp. 1-21.
——	Successful botanical expedition to Colombia. Bull. Pan Amer. Union, Sept. 1923, pp. 221-232, 8 figs.
——	Through the Andes of western Colombia. Annual Rept. Acad. Nat. Sci. Phila., 1922, pp. 15-28, 2 pls.
1924	Notable expeditión botánica a Colombia. Boletín Unión Panamericana, June, 1924, pp. 545-556, 8 figs.
——	The pollination of two tidewater Scrophulariaceae. Bartonia, no. 8, pp. 9-11.
1925	The genus *Afzelia*: a taxonomic study in evolution. Proc. Acad. Nat. Sci. Phila., v. 77, pp. 335-373, 10 figs.
——	The genus *Allophyton* of southern Mexico and Guatemala. Proc. Acad. Nat. Sci. Phila., v. 77, pp. 269-272.
1926	Alexander MacElwee (with H. W. Trudell). Bartonia, no. 9, 1925-26, pp. 1-6, port.
——	Colombia (in Naturalists' Guide to the Americas, pp. 623-636, map).
——	*Allophyton mexicanum*; purple Allophyton. Addisonia, v. 11, no. 1, pp. 13-14, col. pl.
——	Botanical travel in Peru and Chile. Yearbook Acad. Nat. Sci. Phila., 1925, pp. 5-18, 4 figs. (published verbatim, with 1 extra fig. in Bull. Pan Amer. Union, 1926, pp. 1226-1239).
——	The elder Barton—his plant-collection and the mystery of his Floras. Bartonia, no. 9, 1925-26, pp. 17-34.
1927	*Agalinis fasciculata*. Rough-stemmed Agalinis. Addisonia, v. 12, no. 3, pp. 47-48, col. pl.
——	Through the Andes of western Colombia. Jour. N. Y. Bot. Gard., v. 28, pp. 186-189.
1928	*Mazus japonicus*. Oriental Mazus. Addisonia, v. 12, no. 2, pp. 25-26, col. pl.
——	*Agalinis* and allies in North America—I. Proc. Acad. Nat. Sci. Phila., v. 80, pp. 339-449. 17 maps, charts A-B.
——	Notes on Scrophulariaceae of the northwestern United States. Bull. Torrey Bot. Club, v. 55, pp. 315-318.
1929	*Agalinis* and allies in North America—II. Proc. Acad. Nat. Sci. Phila., v. 81, pp. 111-249. Maps 18-52, charts C-F.
——	Charles D. Lippincott. Bartonia, no. 10, 1927-28, p. 53.
——	The genus *Chelone* of eastern North America (with E. T. Wherry). Bartonia, no. 10, 1927-28, pp. 12-23, pls. 3-4
——	Hugh B. Meredith. Bartonia, no. 11, p. 56.
——	Jacob H. Grove. Bartonia, no. 11, p. 50.
——	John William Harshberger. Bartonia, no. 11, pp. 51-55.
——	A new *Maurandya* from Arizona. Jour. Wash. Acad. Sci., v. 19, pp. 69-71.
1930	Genotypes of the Scrophulariaceae in the first edition of Linné's " Species plantarum ". Proc. Acad. Nat. Sci. Phila., v. 82, pp. 9-26.
——	On some critical species of the serpentine barrens. Bartonia, no. 12, 1929-30, pp. 1-23.
1931	*Aureolaria* Rafin. Pflanzenareale, ser. 3, pt. 1, p. 9, maps 7-10.
——	Botanical results of the Tyler-Duida expedition: Scrophulariaceae. Bull. Torrey Bot. Club, v. 58, p. 466.
——	*Escobedia*—a neotropical genus of the Scrophulariaceae. Proc. Acad. Nat. Sci. Phila., v. 83, pp. 411-426, 1 fig.
——	Henry A. Lang. Bartonia, no. 12, 1930, pp. 54-55.
——	*Mimulus ringens*. Violet monkey-flower. Addisonia, v. 16, no. 2, pp. 31-32, col. pl.
1932	The botanical interest of Dr. Henry Leffmann. Bartonia, no. 13, 1931, pp. 53-54.
——	Gift of Schweinitz record-books. Bartonia, no. 13, 1931, pp. 50-52.
——	"*Polygala verticillata*" in eastern North America. Bartonia, no. 13, 1931, pp. 7-17, pls. 2-3, 3 maps.
——	Some belated corrections to my revision of *Veronica* in America. Rhodora, v. 34, pp. 149-151.
——	William Trimble (1847-1932). Bartonia, no. 14, pp. 53-54.
1933	*Fimbristylis darlingtoniana*, a sedge peculiar to the serpentine barrens. Bartonia, no. 15, pp. 27-31, 1 fig.
——	*Polygala verticillata* and the problem of typifying Linnean species. Bartonia, no. 15, pp. 38-45.
——	A revision of *Synthyris* and *Besseya*. Proc. Acad. Nat. Sci. Phila., v. 85, pp. 77-106, 1 fig., 2 maps.

1934 *Castilleja* in Alaska and northwestern Canada. Proc. Acad. Nat. Sci. Phila., v. 86, pp. 517-540, 1 fig., 6 maps.

—— How field study can modify older taxonomic concepts. Bull. Torrey Bot. Club, v. 61, pp. 85-88.

—— A note on the distribution of *Synthyris schizantha*. Proc. Acad. Nat. Sci. Phila., v. 86, pp. 515-516.

—— Scrophulariaceae of the northwestern United States—II. *Pedicularis* of the group Bracteosae. Bull. Torrey Bot. Club, v. 61, pp. 441-448.

1935 The botanist Schweinitz and his herbarium. Bartonia, no. 16, 1934, pp. 1-7.

—— Humphry Marshall, botanist. Bull. Friends' Historical Assoc., v. 24, no. 2, pp. 77-82.

—— Rhinanthaceae. (In Small's Manual of southeastern flora, pp. 1182-1225, figs.)

—— The Scrophulariaceae of eastern temperate North America. Monograph Acad. Nat. Sci. Phila. no. 1, 650 pp., text figs., 155 maps.

1936 Botanical results of the Archbold expedition. No. 7, New and noteworthy Papuan Scrophulariaceae. Brittonia, v. 2, pp. 177-188.

—— Elias Durand and his association with the Academy of Natural Sciences of Philadelphia. Bartonia, no. 17, 1935, pp. 33-39.

—— Manual of the southeastern flora (A review of J. K. Small's 1933 work). Bartonia, no. 17, 1935, p. 48.

—— Travels and scientific collections of Thomas Nuttall. Bartonia, no. 18, pp. 1-51, 5 pls. incl. ports.

1937 Indices of states, places and railroad routes of Mexico. (Supplement to Helen Burns Davis' Life and work of Cyrus Guernsey Pringle), 14 pp.

—— A new Indian paint-brush from Mount Rainier (with G. N. Jones). Proc. Biol. Soc. Wash., v. 50, pp. 207-210.

—— A new species of *Synthyris* from Idaho (with F. W. Gail). Amer. Jour. Bot., v. 24, pp. 39-40.

1938 *Castilleja* in the Charleston Mountains, Nevada. Proc. Acad. Nat. Sci. Phila., v. 89, 1937, pp. 419-424.

—— "*Commelina communis*" in the eastern United States. Bartonia, no. 19, 1937, pp. 19-22.

—— Correction as to the altitudinal occurrence of *Buchnera*. Brittonia, v. 3, p. 95.

—— An English obituary account of Thomas Nuttall. Bartonia, no. 19, 1937, pp. 50-53.

—— A new club-flower from Nevada. Proc. Acad. Nat. Sci. Phila., v. 90, pp. 11-13.

—— Taxonomy and distribution of *Aragoa*, and its bearing on the geological history of the northern Andes. Proc. Acad. Nat. Sci. Phila., v. 89, 1937, pp. 425-432, 1 fig., 1 map.

—— What is *Commelina communis?* Proc. Acad. Nat. Sci. Phila., v. 90, pp. 31-39, pl. 8.

1939 Botanical results of the Archbold expeditions; new and noteworthy Papuan Scrophulariaceae. II. Jour. Arnold Arbor., v. 20, pp. 75-84.

—— A new *Veronica* from New Guinea. Not. Nat. Acad. Nat. Sci. Phila., no. 23, 2 pp.

—— On the typification of Linnean species as illustrated by *Polygala verticillata*. Rhodora, v. 41, pp. 378-384.

1940 Arthur N. Leeds. Bartonia, no. 20, 1938-39, pp. 30-32, port.

—— The botanical work of Witmer Stone. Bartonia, no. 20, 1938-39, pp. 33-37.

—— New light on Rafinesque. Chron. Bot., v. 6, pp. 125-126.

—— New species of Scrophulariaceae from Arizona. Not. Nat. Acad. Nat. Sci. Phila., no. 43, 10 pp.

—— Some new species of Scrophulariaceae from Guiana. Not. Nat. Acad. Nat. Sci. Phila., no. 46, 6 pp.

1941 The function of flowers. Frontiers, v. 5, pp. 116-119, 3 figs.

—— New Scrophulariaceae from Oregon—I. *Mimulus* and *Penstemon*. Not. Nat. Acad. Nat. Sci. Phila., no. 71, 16 pp.

—— Scrophulariaceae of Trans-Pecos Texas. Proc. Acad. Nat. Sci. Phila., v. 92, 1940, pp. 289-308.

1942 Benjamin Smith Barton as naturalist. Proc. Amer. Phil. Soc., v. 84, pp. 108-122.

—— Botanical collectors of the Philadelphia local area. Bartonia, no. 21, 1940-41, pp. 38-57, 64.

—— The life and work of Rafinesque. Transylvania Coll. Bull., v. 15, no. 7, pp. 10-70, 1 facs.

—— New Scrophulariaceae from Oregon—II. *Castilleja*. Not. Nat. Acad. Nat. Sci. Phila., no. 74, 11 pp.

—— Some new Scrophulariaceae from Montana and adjacent Idaho and Wyoming. Not. Nat. Acad. Nat. Sci. Phila., no. 95, 11 pp., 2 figs.

1943 Botanical collectors of the Philadelphia local area (Concluded). Bartonia, no. 22, 1942-43, pp. 10-31, 66.

—— The Scrophulariaceae of the western Himalayas. Monograph Acad. Nat. Sci. Phila., no. 5, 163 pp., 25 pls.

—— A second summary of the Scrophulariaceae of New Guinea. Jour. Arnold Arbor., v. 24, pp. 243-274, 5 pls.

—— To the Paramo de Chaquiro. Amer. Fern Jour., v. 33, pp. 81-96, 1 pl.

1944 Concerning "Genotypes". Science, v. 99, n. s., no. 2573, pp. 320-321.

—— Critical index, with explanatory comments [to] A life of travels, by C. S. Rafinesque. Chronica botanica, v. 8, no. 2, pp. 354-360.

1945 The genus *Calceolaria* in southeastern Peru. Proc. Acad. Nat. Sci. Phila., v. 97, pp. 137-177, pls. 7-16.

—— Historical sketch (In Frans Verdoorn's Plants and plant science in Latin America, pp. 35-48, pl. 21.)

—— How Durand acquired Rafinesque's herbarium. Bartonia, no. 23, 1944-45, pp. 43-46.

1946 Reconsideration of the Bacopa-Herpestis problem of the Scrophulariaceae. Proc. Acad. Nat. Sci. Phila., v. 98, pp. 83-98.

—— Species of *Stemodia* and *Galvezia* (Scrophulariaceae) on the coast of Ecuador and northern Peru. Not. Nat. Acad. Nat. Sci. Phila., no. 179, 6 pp.

1947 A collection of plants from Yakutat, Alaska (with Leslie D. Stair). Bartonia, no. 24, 1946, pp. 9-21 and pl. 6.

—— A naturalist in the making [Review of Lady Nora Barlow's two books Charles Darwin's diary of the voyage of H.M.S. *Beagle* and Charles Darwin and the voyage of the *Beagle*]. Frontiers, v. 12, no. 1, pp. 19-20.

—— Otway H. Brown (with W. M. Benner). Bartonia, no. 24, 1946, pp. 80-81.

—— Some hitherto undescribed Scrophulariaceae of the Pacific States. Proc. Acad. Nat. Sci. Phila., v. 99, pp. 155-199.

1948 Quaker botanists. Bull. Friends' Hist. Assoc., v. 37, pp. 3-13, 63-82.

—— The taxonomic significance of an understanding of floral evolution. Brittonia, v. 6, pp 301-308.

1949 The last sickness of Rafinesque. Bartonia, no. 25, pp. 67-68.

—— Toward a simple and clear nomenclature. Amer. Jour. Bot., v. 36, pp. 19-22.

1950 *Castilleja nivea*, snowy Indian paint-brush (Scrophulariaceae), a new species from the northern Rocky Mountains (with Marion Ownbey). Not. Nat. Acad. Nat. Sci. Phila., no. 227, 3 pp.

—— *Cordylanthus capillaris*, a new bird's-beak (Scrophulariaceae) from California. Not. Nat. Acad. Nat. Sci. Phila., no. 223, 2 pp.

—— Historical botanical collections of the American Philosophical Society and the Academy of Natural Sciences of Philadelphia. Proc. Amer. Phil. Soc., v. 94, 1949, pp. 137-151, 20 figs.

—— The identity of *Hasslerella* Chodat. Lilloa, v. 23, pp. 61-62.

1951 The genus *Calceolaria* in Ecuador, Colombia and Venezuela. Proc. Acad. Nat. Sci. Phila., v. 103, pp. 85-196, pl. 6-7, 34 figs.

—— A new Indian paint-brush from the Mogollon Plateau of Arizona (*Castilleja*: Scrophulariaceae). Not. Nat. Acad. Nat. Sci. Phila., no. 237, 2 pp.

—— A new velvety monkey-flower from California (*Mimulus*: Scrophulariaceae). Not. Nat. Acad. Nat. Sci. Phila., no. 235, 2 pp.

—— On the systematics of *Penstemon*. Nat. Hort. Mag., pp. 8-15.

—— Scrophulariaceae (except *Penstemon* and *Orthocarpus*). (In Leroy Abrams' Illustrated flora of the Pacific States, Washington, Oregon and California, v. 3, pp. 686-733, 770-810, 819-859, figs. 4516-4637, 4729-4822, 4845-4944.)

—— Studies of plants, especially of the family of Scrophulariaceae. (Report on grants from funds administered by the Amer. Phil. Soc.) 1934-1949. Yearbook Amer. Phil. Soc., 1950, pp. 176-180.

—— The united-leaved Calceolarias of the northern and middle Andes (Scrophulariaceae). Not. Nat. Acad. Nat. Sci. Phila., no. 236, 3 pp.

1952 The genus *Achetaria* (Scrophulariaceae) of lowland South America. Not. Nat. Acad. Nat. Sci. Phila., no. 244, 4 pp.

Francis Whittier Pennell

Francis Whittier Pennell, President of the Philadelphia Botanical Club, died of a heart attack while talking to a group of persons, in the Friends Meeting House, at Media, Pennsylvania, Sunday, February 3rd, 1952. He had been in poor health for several weeks but his death came unexpectedly, as he had been at his desk in the Academy of Natural Sciences as late as February 1st. His home was at Moylan, near Media and he is survived by his wife, Anne W., a son Francis C. and by several brothers and sisters.

Dr. Pennell was born August 4th, 1886, on a farm near Wawa, Delaware County. He was educated at Friends Westtown School, in Chester County and at the University of Pennsylvania, where he received his bachelor's degree in 1911 and his doctorate in 1913.

At an early age Dr. Pennell showed an interest in Nature and it was through Dr. William Trimble of Concordville, Chester County, that he was made acquainted with the native flora of that region.

In 1905 and 1906 he was a student assistant in the Herbarium of the Academy of Natural Sciences, Philadelphia. In 1908 and 1909 he became interested in the Serpentine Barrens of Delaware and Chester Counties, making extensive collections which helped to form a basis for a paper " The Flora of the Serpentine Barrens ", published in the Proceedings of the Academy of Natural Sciences for 1910 and 1912.

While attending the University of Pennsylvania, Dr. Pennell came under the influence of the late Dr. John M. Macfarlane, then head of the Department of Botany, who persuaded him to take up Botany as his life work. Dr. Macfarlane was much enthused over Darwin's views concerning evolution through natural selection, especially as applied to the Scrophulariaceae and suggested study of members of this family as a topic for a doctoral thesis. This led first to a special study of the " Gerardia " group and eventually to his becoming an international authority on this complex plant family, the Scrophulariaceae.

Dr. Pennell served as associate curator at the New York Botanical Garden from 1914 to 1921 and since 1921, as Curator of Plants at the Philadelphia Academy of Natural Sciences.

In later years he kept his interest in the local flora and published studies in various groups of plants, but gave most attention to the Scrophulariaceae in all parts of the world. He became so engrossed in this work that at times the very thought of also being " Curator of Plants ", seemed to be quite annoying to him. He delegated most of the curatorial work to other members of the staff and to volunteer workers.

Next to his favorite family of plants his interest was in botanical history. He possessed a remarkable fund of information on this topic and was especially well informed on the history of botany in Philadelphia and vicinity. He was a prolific writer and a bibliography of his writings appears elsewhere in this issue.

Besides numerous botanical expeditions to various parts of the United States, he visited Mexico in 1934, 1935, 1937, 1938 and 1940; Colombia in 1917-18 and 1922, Peru and Chile in 1924-25 and Peru in 1948. The 1948 trip to the Peruvian Andes was made just a few months after recuperating from a heart attack. He spent over four months on this trip and traveled the entire distance to and from Peru by airplane—his first experience with this type of travel.

Dr. Pennell was quiet, modest and reserved yet easily approached. He had a very active mind and those who accompanied him in the field were impressed by his keen observations of phenomena and relationships among plants and not only those of his chosen family. He was always ready to discuss any botanical topics and could do so in a most pleasing manner. His willingness to help any one who showed interest in botany, encouraged a number of beginners in the subject.

He was a member of the American Association for the Advancement of Science, The Botanical Society of America, The American Society of Plant Taxonomists, of which he was president in 1942, The Torrey Botanical Club, The Pennsylvania Botanical Society and Philadelphia Botanical Club since 1910 and has been its president since 1942 also editor of Bartonia since 1924.

His loss is keenly felt by professional botanists and by his many friends.—WALTER M. BENNER.

Morris Evans Leeds

Morris Evans Leeds, the last survivor of the group of founders of the Philadelphia Botanical Club in 1891, died February 8, 1952, at Lake Wales, Florida. His home was in Mount Airy, Philadelphia. Surviving are his wife Hadassah M. and two daughters, Esther Hallett and Mary Maule.

Mr. Leeds was born in Philadelphia, March 6, 1869. He attended Westtown School, Chester County and Haverford College where he received his Bachelor of Science degree in 1888. From 1888 to 1890 he taught at Westtown School. It was during this early period that he was most active in the pursuit of botany, although he retained his membership in the Philadelphia Botanical Club until his death.

In 1892-93 Mr. Leeds attended two semesters at the University of Berlin. His interests shifted to engineering and eventually to manufacturing and he was founder of the Leeds and Northrop Company, Philadelphia, manufacturers of electrical instruments, serving as president from 1903 to 1939 and as chairman of the board since 1939.

Mr. Leeds was awarded the Edison Medal of the American Institute of Electrical Engineers in 1949 for his development and production of precision measuring instruments and controls. Other awards were the Edward Longstreth Medal of Merit of the Franklin Institute, the Henry Lawrence Gantt Medal of the Institute of Management and the Medal of the American Society of Mechanical Engineers. In 1936 the Brooklyn Polytechnic Institute conferred on him the honorary degree of Doctor of Engineering.

Mr. Leeds was also actively interested in civic affairs having served as a member of the Philadelphia Board of Education from 1931 to 1950 and as its president from 1938 to 1948. He was an authority on industrial relations and served with the Business Advisory Council of the Department of Commerce from 1933 to 1939. He also served on President Roosevelt's Committee on Economic Security.—WALTER M. BENNER.

The Pine Barrens of New Jersey *

INTRODUCTION

JOHN A. SMALL

New Jersey College for Women, Rutgers University, The State University of New Jersey

This symposium was arranged through the cooperation of Section G of the American Association for the Advancement of Science and the Ecological Society of America. It appropriately deals with the Pine Barrens because they are nearby, the Philadelphia Botanical Club has studied them for years, and there is to be a field trip to see them on December 30.

The Pine Barrens represent a large area, some 2,000 square miles, on the coastal plain of southern New Jersey. Here will be found dry, rapidly drained sand and, at the other extreme, bogs and meadows. It is after all a misnomer to call the area Pine Barrens. It includes thousands of acres of pines, but it is not really barren. Rarely will a place be found where the canopy is not closed. There is an abundance of ground plant species, though their density may be low. Besides pine, the canopy in some places consists of oaks, and in still other places, along the streams, it consists of southern white cedar. There is a considerable variety in the soils, though sand will always be in sight.

The Pine Barrens has long been a favorite study area for classes and research workers among botanists and other scientists. The University of Pennsylvania, Princeton, and Rutgers classes visit the pine barrens regularly. One of our panel members is from Yale, another is from Butler University, indicating that in some respects the pine barrens may be better known outside of the State than they are by our residents.

The Pine Barrens are at something of a crossroads. They have been on the main stream of eastern seaboard commerce since Colonial times. Ship building, charcoaling, the bog iron industry, sphagnum gathering, cranberry culture, and most recently blueberry plantations, have competed with real estate developments, recreation, water reserves, forestry, and various other agricultural attempts. Not all of these uses are mutually compatible and it is of the utmost importance that, with the imminence of expanding industrial and residential activity, long-range planning for the area be considered.

It is not expected that final solutions will be reached today or that any resolutions will be drawn up. Our panel is made up of authorities in their respective fields. It is our hope that these papers, not all of which are in agreement, will stimulate careful thought and long range planning for the best use or uses of this area.

---

* Symposium presented during the 118th meeting of the American Association for the Advancement of Science, the Philadelphia Municipal Auditorium, December 29, 1951.

What Can be Inferred from Pollen Profiles of Bogs in the New Jersey Pine Barrens *

J. E. Potzger

Butler University, Indianapolis, Indiana

In 1944 the writer (8) made a study of eight bogs in the Pine Barren region of New Jersey and was surprised at the total lack of a successional trend in the forest history. All bogs rather suggested from the very beginning a highly mixed forest cover in which northern conifers were associated in a minor way with southern broad-leaved genera. The more the pollen profiles were studied critically the more the conclusion seemed justified that unglaciated New Jersey was during Wisconsin times a refugium for southern broad-leaved trees, with intrusions of the association by such boreal genera as spruce and fir.

The peat examined for the 1944 study was collected by WPA workers under the direction of Dr. S. A. Waksman. The material always gave every evidence of careful collection, free of any contamination. To Dr. Waksman the writer is also indebted for the core from Tuckerton Tidal Marsh.

During August of 1951 a special trip was made to the Pine Barrens to get first-hand impressions, to become familiar with the peat deposits of southern New Jersey, especially with respect to the basins where the peat had accumulated, and to collect personally some additional cores. The aim was to select bogs which would geographically represent a transect from the Cape May region to the terminal moraine north of New Brunswick. It was hoped that such plan would assure discovery of possible patterns of forest associations, but specifically would show where typical climatic succession made its appearance in southern New Jersey.

The writer and his assistant, Robert G. Lipscomb, express their gratitude to the following persons: Dr. John A. Small and Dr. M. F. Buell for hospitality extended and for personally conducted field trips to suitable locations; to Mr. Silas Little of the Lebanon State Forest for valuable information on the Pine Barrens and for permission to make our headquarters at his office; to various members of the Botany Department of Rutgers University for information and assistance. For figure 1 we thank Mrs. Margaret Esther Potzger.

CONCEPTS OF CENTERS OF POST-GLACIAL PLANT DISTRIBUTION

During the time antedating that of work in pollen analysis, relic communities and philosophic interpretations formed the bases upon which plant migrations and centers of distribution were interpreted. Outstanding contributions during this period were papers by Adams (1), Gleason (2), Transeau (11) and Harshberger (5). The last gave special consideration to plant migration in New Jersey. These philosophies favored in general one large distributional center in the southern Appalachians, from which the individual tree species, or associations of species, fanned out north and northwestward. From numerous pollen studies which yield concrete evidence of both qualitative and quantitative nature we have learned about other refugia, nearer to the margin of the ice, where southern species persisted during the occupation of areas in northern latitudes by the ice cap. The study of pollen records in peat from the Pine Barrens in 1944 led to the conclusion that this region was such a center of distribution from which, perhaps, the forests to the north and northeast originated. Never before had the writer found such great contrasts in the history of forests within short geographical distances, as those encountered in unglaciated and lower glaciated New Jersey. However, one does not always have the good fortune to find satisfactory peat deposits in unglaciated border areas as in New Jersey.

---

* This is publication 252 of the Botanical Laboratory of Butler University.

Geological Problems

From the geological reports of Salisbury (10) and of Kümmel (6), as well as from the publications of Antevs (2), one can get a faint picture of the complexity of topography of New Jersey, especially of the southern part of the state, with which this paper is chiefly concerned. In the present study one of the most significant problems deals with the age of the peat, i. e. whether these sediments are of glacial or post-glacial dates. Waksman *et al.* (12), quoting Shaler and Johnson, estimated the time that certain salt marshes of New Jersey required to develop as 2,000 to 2,300 years. On basis of age of peat at the 8-foot level of a bog in Minnesota, and of peat from an Indiana bog, determined by Libby (7) with radiocarbon dating, this estimate seems much too low. In Minnesota nearly 750 years were required for accumulation of one foot of peat.

Another perplexing question is whether fresh water sediments were covered by salt water (Tuckerton Tidal Marsh) because of raising of the ocean level or because of sinking of the shoreline. Antevs (2) favors the former concept. In his estimation sufficient water had been removed from the oceans to have sea level lowered about 300 feet. He says, " New Jersey probably extended some 80 miles beyond the modern coast line . . . " the transgression leading to the modern state of affairs no doubt was essentially brought about by the rise of the sea level as the last ice sheets melted and the water was restored to the oceans . . . " the existing relation of land and sea was at least nearly attained 6,000 to 3,000 years ago."

Descriptions of the Bogs

The Bidwell Tidal Marsh is perhaps a half mile wide where highway 49 crosses the small Dias Creek. It is typical of the brackish river valleys so common along the New Jersey coastal region. Sedges and grasses constitute the vegetation to-day, and the main creek channel is broken up in an anastomosing series of channels of open water. The boring was made about 200 feet west of the highway, about 1,000 feet north of the creek.

The North Branch Bog is a densely wooded valley of the north branch of Mount Misery River. Boring was made about 1,000 feet west of the road in the Lebanon State Forest.

Tuckerton Tidal Marsh is a vast expanse of brackish sedge-grass marsh. Fresh water peat is overlain with marine sediments. Peat totalled 19 feet, and a foot of sand was included in the core.

Helmetta Bog is located near the village of that name. It has all appearances of having developed from a shallow lake. To-day it is covered by a quaking mat with a dense growth of *Sphagnum*. *Chamaedaphne* and other shrubs are well established on the mat. Boring was made in the deepest place, determined by numerous trial borings. This proved to lie close to the center of the bog. It was the only bog studied where green-sand constituted the bottom layers. Two feet of the sand were included in the core, and boring was discontinued when the borer struck gravel mixed with sand.

Ash Swamp lies just within the terminal moraine, about 15 miles north of New Brunswick, near Plainfield. It is at present covered by dense deciduous forest. The peat has an extremely dark color, and it is composed chiefly of leaves of mosses, with no evidence of having ever had a *Sphagnum* mat.

Characteristics of the Peat Deposits

To the worker in pollen studies of eastern North American the bogs of southern New Jersey are at first bewildering, especially to one who has built up the concept that the ideal bog, free of post-shedding transport of pollens, is the kettle-type depression of limited area. Such " ideal " bogs are not found in the Pine Barrens, nor in southern New Jersey in general. The one at Helmetta may be an exception. In this region peat accumulated chiefly in fresh water of river valleys, or in submerged valleys now covered by brackish water, where fresh water sediments are overlain by marine deposits. The Tuckerton Tidal Marsh and the Bidwell Tidal Marsh are of this type. It is very striking that the small streams of the Pine Barrens have extremely wide valleys. The accumulation of peat, frequently four to five feet in depth, must mark a decline in volume of water in these valleys. Naturally, one wonders when this took place.

To-day many of the peat-filled valleys have a dense cover of southern white cedar (*Chamaecyparis*), but the pollen of this tree apparently does not preserve in peat. Such an omission in a pollen profile is very much regretted. Occasional layers of charcoal overlying the sandy bottom seem to indicate that fire played a part in the forest history even in primeval times. It would make interpretation of pollen records less difficult if we knew the physiographic recent past of the valleys in southern New Jersey.

METHODS

A Hiller-type borer was used to take the samples. Small amounts of the sediment were placed into 4-dm vials, which were then labelled and closed with a stopper. Each sample represents not more than about one-inch in depth at a given foot-level. In the laboratory a portion of the peat was placed into a small vial and boiled in KOH. The sample was washed six times, allowing for complete settling after each washing. At the close of washing, alcohol was substituted for water and one per cent gentian violet was added as stain. Mounts were made in glycerine jelly. While 150 to 200 pollen grains were counted for most foot-levels, when pollen was very sparse, so that even after settling out from an agitated solution only one or two pollen grains were found on a slide, smaller numbers of grains were counted. This was the case at the following places: Ash Swamp: 2½′ (75), 7′ 8″ (50), 7′ 10″ (50). Bidwell: 6′ (90), 6¾′ (40).

Tuckerton Tidal Marsh is considered typical of Pine Barren pollen profiles, since the forest history here is almost identical with that recorded in the bogs within the present-day Pine Barrens. This bog must have existed during all or most of the Wisconsin times, to account for its great thickness of freshwater peat covered by marine sediments.

All pollens of birch were measured and those at least 28 microns across the widest point, rounded in outline, were recorded as *Betula lutea*. *Betula papyrifera* may measure 28 microns but the outline of the grain is strikingly triangular. *Betula pumila*, *B. populifolia*, and *glandulosa* have rounded grains but are less than 28 microns in diameter.

RESULTS

The records from the five bogs studied as a transect of southern New Jersey are so near the anticipated outcome as to be difficult to believe. It was assumed that if the Pine Barrens and adjacent southern New Jersey constituted a refugium during Wisconsin times, a mixture of boreal and southern broad-leaved genera should characterize the vegetation of this area. As one proceeded northward and approached the terminal moraine spruce and fir should become more prominent in lower levels; a poorly defined climatic succession should make its appearance, and at the terminal moraine typical succession from spruce-fir, to pine, to broad-leaved forest (chiefly oak) should be encountered. This has previously been reported by Potzger and Otto (9) for northern New Jersey. Figure 1 shows how well reality approximates the hypothesis. Fir, spruce, both black and white, are recorded to the southernmost tip of New Jersey, and associated with them are southern broad-leaved genera, of which *Liquidambar*, *Castanea* and *Carya* should perhaps be named specifically.

Oak and pine are the dominant genera. Changes in species of pine are indicated as one proceeds from lower to upper levels. The extremely small pollen grains have all appearances as being those of *Pinus banksiana*, but no way was discovered by which an absolute separation of the various species could be made. Overlapping in size of grain, especially between *P. banksiana* and *P. virginiana*, would make a distinction between these subject to considerable possibility of error. The high peak of birch at the 17-foot level of the Tuckerton Tidal Marsh and the charcoal overlying the bottom layer of sand in the North Branch Bog point to a series of fires or to one large regional fire.

Succession in the strict sense of the term is wanting, but the two lowermost foot-levels in the Tuckerton Tidal Marsh (Fig. 1) indicate a southern type of forest cover followed by intrusions of a few boreal genera, thus hinting at a deteriorating climate. The Helmetta Bog (Fig. 1) records no southern broad-leaved genera in the lower levels. The initial forest is an association of conifers, and broad-leaved genera enter later as climatic succession occurred. Spruce does not exceed 20 per cent but pine was extremely prominent while the lowermost foot-levels were being deposited. About 15 miles northward, just within the terminal moraine near Plainfield, succession proceeds beautifully from an initial spruce-fir-pine association to pine, to broad-leaved genera, chiefly oak associated with hemlock and hickory.

A very unusual feature in the Tuckerton Marsh is the abundance of fern sporangia and spores of *Dryopteris* and *Osmunda* at the 17-foot level, and the abundance of grass pollens at nearly all foot-levels. Quite abundant also were *Ilex*, *Corylus*, and *Alnus* in the five lowermost levels. All but *Alnus* were absent in the upper three-fourths of the marsh profile. Pollen of *Ilex* and spores of *Sphagnum* were the most abundant non-tree microfossils at the North Branch Bog.

Discussion

The geologic history of southern New Jersey is still not definitely understood, but the various views seem to agree at least on the assumption that the southern part of the state was not submerged, or at least not entirely, during Pleistocene times. In the present study the major problem concerns itself with at least some land above sea-level during Wisconsin time. That this assumption is correct may also be inferred from the uninterrupted pollen profiles in the 20-foot deep Tuckerton Tidal Marsh. All other bogs studied are shallow, but even in these we have no indication that a part of the vegetational history is omitted because of truncated lower portions of the profiles (Fig. 1). The deep Tuckerton Tidal Marsh records essentially the same forest history as the bogs of the Pine Barrens studied at this time and those considered in 1944. It is, of course, not easy to detect truncation because the vegetation lacked typical successional trends, but is very uniform from bottom to top. For that reason the Tuckerton Tidal Marsh was designated as type.

In southern New Jersey the forest appears to have been of a decided mixed type in which conifers and deciduous species, representing both boreal (in low percentage representation) and southern tree genera participated in the forest complex. *Picea glauca*, *P. mariana*, *Abies* and *Tsuga* are no longer extant in the Pine Barrens, but their former range encompassed all of the southern section

FIGURE 1. Pollen Profiles from the Pine Barrens of Southern New Jersey.

of New Jersey. One should, however, point out that spruce and fir are represented in all bogs, and in some of them persist to the topmost foot of peat. This suggests their very recent disappearance in southern New Jersey. A question which always troubles the interpreter deals with the cause of the wide river valleys, decline of water in streams, and subsequent deposition of peat. It is a troublesome question because it poses the second question whether the peat is actually of Wisconsin time origin. In this maze of unsolved physiographic history one involuntarily turns to the Tuckerton Tidal Marsh with its 20 feet of sediments. If submergence of the coastal area was of post-Wisconsin date, as assumed by Antevs (2), then the southern New Jersey coastal plain must have been above sea level, and must have had a forest vegetation, otherwise the Tuckerton Marsh could not have fresh water sediments with pollen content representative of a mixed coniferous-deciduous forest complex.

It is very difficult to correlate the profiles from the Pine Barrens and New Jersey coastal plain with Deevey's (3) climatic and vegetational cycles for Connecticut. This would be expected since we cannot find much similarity between the vegetational history of southern New Jersey and that near the terminal moraine. There is, however, some similarity between the Helmetta profile and those of Connecticut. At Helmetta the spruce-fir period is somewhat submerged by high pine and some oak, and Deevey's oak-chestnut is represented by pine-oak-chestnut at the Helmetta Bog. At the Ash Swamp correlation with the Connecticut profiles is very good except at the closing period, which at the Ash Swamp is pine-oak-hemlock, resembling somewhat the closing cycle in a New York location quoted by Deevey (3) or a combination of his inland and coastal Connecticut successions. In reality, his initial spruce-fir is similar to that at Helmetta and Ash Swamp, i. e. a pine-spruce-fir association. In support of this interpretation we quote his QN-1; L-2; L-14; L-9; L-10; T-1; JPK-3 profiles.

We know too well from field studies of present day forests that the microclimate of physiography may easily modify macroclimate to a degree that will result in new combinations of pre- and post-climax species, in which the climatic control may still be obvious or, on the other hand, be very much submerged. We have a good example of this latter relation in the vegetation of the Pine Barrens of to-day.

Summary

1. The paper presents results of a pollen analysis of five bogs representing geographically a line from the Cape May region to the terminal moraine near Plainfield, New Jersey.

2. In the Pine Barrens and adjacent southern New Jersey areas the forest history indicates very little change during the centuries that pollen records accumulated in peat. It was rather more or less uniform or static during the entire time. It was a mixed forest in which pine and oak played the most prominent role.

3. Associated with oak and pine were such boreal species as fir, black and white spruce. The second minor element in the association complex were southern broad-leaved genera, i. e. *Acer, Nyssa, Liquidambar, Castanea, Tilia, Carya,* and *Juglans.*

4. Fluctuations in forest type are small and this suggests little change in climate while sediments accumulated.

5. Presence of spruce, fir and hemlock to topmost foot-levels points to a rather recent elimination of these genera on the Pine Barrens and coastal plain of New Jersey.

6. A definite initial spruce-fir forest cover with succession to broad-leaved genera is shown south of New Brunswick at the Helmetta Bog, and is expressed typically in the Ash Swamp Bog within the terminal moraine.

7. The 20-foot deep Tuckerton Tidal Marsh records essentially the same uniform forest conditions as the shallow bogs of the Pine Barrens proper. Since freshwater peat is here overlain by marine sediments it must include in the record the forest history during Wisconsin as well as during post-Wisconsin times while the coastal areas of New Jersey were being submerged by marine invasion. This tidal marsh, therefore, is considered a reliable type with which to compare forest history in the more shallow bogs in the Pine Barrens.

8. Results of the present study add additional credence to the conclusion reached in 1944 that the Pine Barrens and southern New Jersey in general constituted a refugium during Wisconsin times for southern broad-leaved trees. From this distributional center waves of migration of climatically controlled forest types, beginning with the boreal spruce-fir forest, fanned out north and northeastward.

LITERATURE CITED

1. Adams, C. C. Postglacial origin and migration of the life of northeastern United States. Jour. Geogr. 1: 352-357. 1902.
2. Antevs, Ernst. The Last Glaciation. Am. Geogr. Soc., Research Series 17, New York. 1928.
3. Deevey, Edward S. Studies on Connecticut lake sediments. Am. Jour. Sci. 237: 691-724. 1939.
4. Gleason, H. A. The vegetational history of the Middle West. Ann. Assn. Amer. Geogr. 12: 39-85. 1923.
5. Harshberger, John W. Phytogeographic Survey of North America. 1911.
6. Kümmel, Henry B. The Geology of New Jersey. Bul. 50, Geologic Series. Dept. Conservation and Development, Trenton, N. J. 1940.
7. Libby, Willard F. Radiocarbon Dating. The Univ. Chicago Press. 1952.
8. Potzger, J. E. The Pine Barrens of New Jersey, a refugium during Pleistocene times. Butler Univ. Bot. Stud. 7: 182-196. 1945.
9. ———— and James H. Otto. Post-glacial forest succession in northern New Jersey as shown by pollen records from five bogs. Am. Jour. Bot. 30: 83-87. 1943.
10. Salisbury, Rollin D. Geological Survey of New Jersey. Vol. 5, Glacial Geology. 1902.
11. Transeau, E. N. On the geographic distribution and ecological relations of the bog plant societies of northern North America. Bot. Gaz. 36 (6): 401-420. 1903.
12. Waksman, S. A., H. Schulhoff, C. A. Hickman, T. G. Gordon and S. T. Stevens. The peats of New Jersey and their utilization. Dept. Conserv. and Development, Trenton, N. J. 1943.

Soil Conditions in the Pine Barrens of New Jersey

J. C. F. TEDROW [1]

Scientists have studied the Pine Barrens in New Jersey for more than half a century, yet no single explanation as to their origin has been entirely satisfactory. The object of this paper is to show the distribution of the soil types and their relation to the lithology of the parent materials, and the distribution of the pine-barren area. It is believed that the presence of the Pine Barrens can be explained on the textural composition of the soil materials, which are responsible for:

1. True Podzol (Lakewood).
2. Low moisture-holding capacity of the soil.
3. Low nutrient status of the soil.
4. Low growth rate of the vegetation.

GEOLOGY

The Pine Barrens lie entirely within the limits of the Coastal Plain province. Geologic materials consist mainly of unconsolidated sands and gravels occurring in beds that dip gently seaward. Elevation is usually less than 200 feet. Topography is undulating to gently rolling. Of the numerous geologic formations that have been identified, only the following are pertinent to this report:

Quaternary — Cape May
Bridgeton

Tertiary — Cohansey
Kirkwood

Several workers have tried to relate the pine-barren area with certain geologic formations, but the critical review of Lutz (8) showed that there is no good correlation between the two. Stone (12) recognized that the soil is an important factor in the distribution of the pine-barren flora.

SOILS

The soils of the Pine Barrens are formed from extremely sandy materials, at times with considerable amounts of well-rounded quartzitic gravel. The mature soils of the area are, with few exceptions, true Podzols. In a sense, this great soil group is geographically out of place. Under the climatic conditions found in southern New Jersey, one would expect a Gray-brown Podzolic regional soil. Instead, a true Podzol is found with well-developed features. The reason lies in the unusual characteristics of the soil materials, as a result of which the soils deviate from the normal climatic type.

---

[1] Paper of the Journal Series, New Jersey Agricultural Experiment Station, Rutgers University—the State University of New Jersey, Department of Soils.

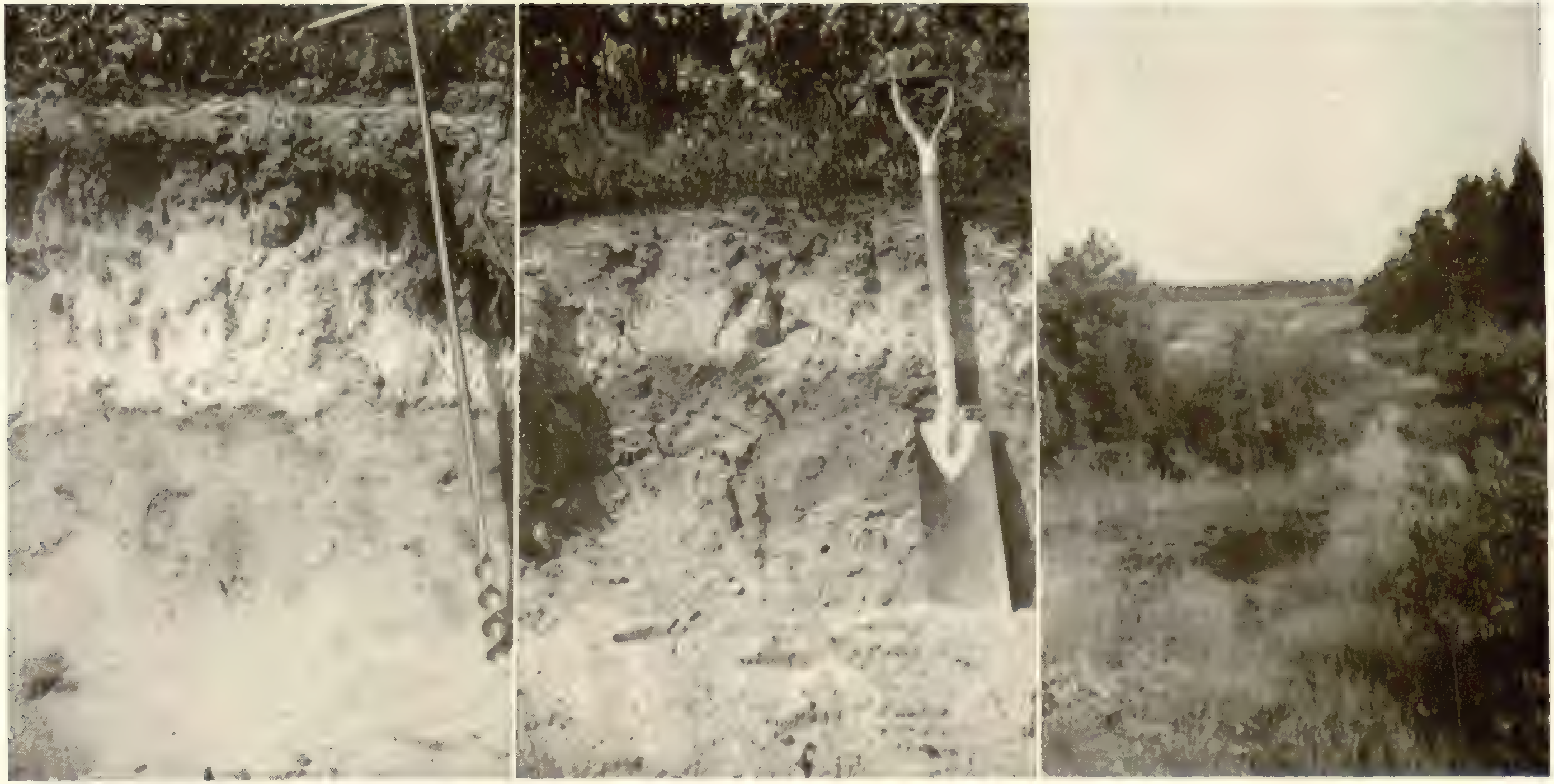


PLATE 2. Left and center photographs show highly podzolized Lakewood soil profiles. Photograph at the right shows a type locality where the St. Johns soil is found.

The podzolic process is both chemical and physical. Under high leaching conditions the soluble and exchangeable materials, such as Na, K, Ca, and Mg, have been largely removed from the solum, except for those remaining in the crystalline state. The less soluble elements, such as Fe, Al, and Ti, have been partly leached from the upper layers and reprecipitated in the subsoil. During the podozolic process, while organic matter is accumulating on the surface (A_0 and A_1 horizons), mineral matter is leached from the soil (A_2 horizon) and redeposited in part in the subsoil (B_1 horizon). Some of the colloidal material of the A_2 horizon also tends to be translocated into the B horizon. With the unusually sandy soil materials of the Pine Barrens, percolation is rapid and leaching is intense. The resultant product is a true Podzol. The mineral makeup of the soil also contributes to its highly podzolized nature. Nearly all of the materials are extremely siliceous and are easily podzolized. Siliceous material is very stable in podzolic soil development and, because of this, a white bleached earth (Bleicherde) layer soon forms in the A_2 horizon.

Though the soils of the Pine Barrens are true Podzols, those in close proximity to the barrens are Gray-brown Podzolic. Marbut (10), in discussing the soils of this region, reported that where there is not much material to leach from the upper layers, soil will reach an advanced stage of development in a relatively short time. The morphology of the mature soils of the subject area, which are mapped as the Lakewood series, consists of the following:

A_1 1-2 inches — black carbonaceous organic material mixed with mineral matter.
A_2 8-20 inches — white or nearly white sand of single-grained structure.
B_1 1-3 inches — coffee-brown sand or loamy sand, often becoming indurated (sometimes absent).
B_2 8-15 inches — light yellow sand of single-grained structure.
C — light yellow to yellow-brown structureless sand and gravel.

Tree roots appear to be concentrated in the A_1 and B_1 horizons, where the few available nutrients that are present are concentrated.

The coarseness of the material produces a low moisture-holding capacity of the soil. Because of high percolation rates and low moisture retention, in only a few hours the soils again reach a high pF value. The Lakewood soil contains little nutrient material for plants. Joffe's (4) analysis of the Lakewood series shows more than 98 percent SiO_2 and 1.4 percent Fe_2O_3 and Al_2O_3. The pH value of the Lakewood soil usually varies between 3.5 and 4.0, a value low enough to bring Al into solution in toxic quantities. Forest fires are common in the Pine Barrens. This is evidenced not only by history but by the presence of charcoal fragments in the surface soil. Excessive drainage results in conditions that offer little opposition to the burning and spreading of fires.

CORRELATION OF PINE BARRENS WITH SOIL CHARACTERISTICS

The soils of the Coastal Plain may be generalized as follows:

ORDER	GREAT SOIL GROUP	SERIES
Zonal Soils	Podzols	Lakewood (sands)
	Gray-brown Podzolic	Sassafras (sands, silts and clays)
		Collington (sands, silts and clays with glauconite)
Intrazonal Soils	Ground-water Podzols	St. Johns (sands)

Figure 1 shows that the Cohansey formation lies almost entirely within the pine-barren area. This material is very sandy, and the soils on it are highly podolized. The cedar swamps are mapped as St. Johns soil. These wet areas result from a high water table rather than from low permeability of the soil.

Near Millville is an area of Cohansey sand that is not included in the pine-barren area. Inspection of this former area revealed that the soil materials are slightly heavier and less highly podzolized, which accounts for their better agricultural qualities. The Pine Plains are located on a part of the Cohansey formation. In this particular area the geologic materials have a greasy feel, and appear to be kaolinized, a condition which is not present in other areas of the Cohansey formation. The sands have a firm consistency and become rather tough when dry. Chemical analysis of the Cohansey formation in the Pine Plains showed 50 pounds of soluble Al per acre, while the same formation in the Pine Barrens showed 25 pounds present. These quantities are sufficient to have a serious toxic effect on vegetation of the area. Whether these differing characteristics are inherited from the geologic materials or have been acquired through soil development is not known.

Only in certain locations is the Cape May formation within the Pine Barrens. MacClintock and Richards (9) divided the Cape May formation into two terraces, one at 40-60 feet elevation and a second at 20 feet. The lower terrace may be further subdivided into two phases, marine and fluvial. The higher terrace is very sandy and excessively drained, like the Cohansey formation, and is invariably included with the pine-barren area. This higher terrace exists mainly on the seaward side of the Pine Barrens. The Cape May formation in southern Cape May County is not a part of the pine-barren area. The terraces here seldom have an elevation of more than 20 feet, and the soils are mapped mainly as the Sassafras (2) series. Although there is little difference in the soil material from that found on the higher terraces, the low position is associated with a high natural water-table, which produces better moisture conditions in

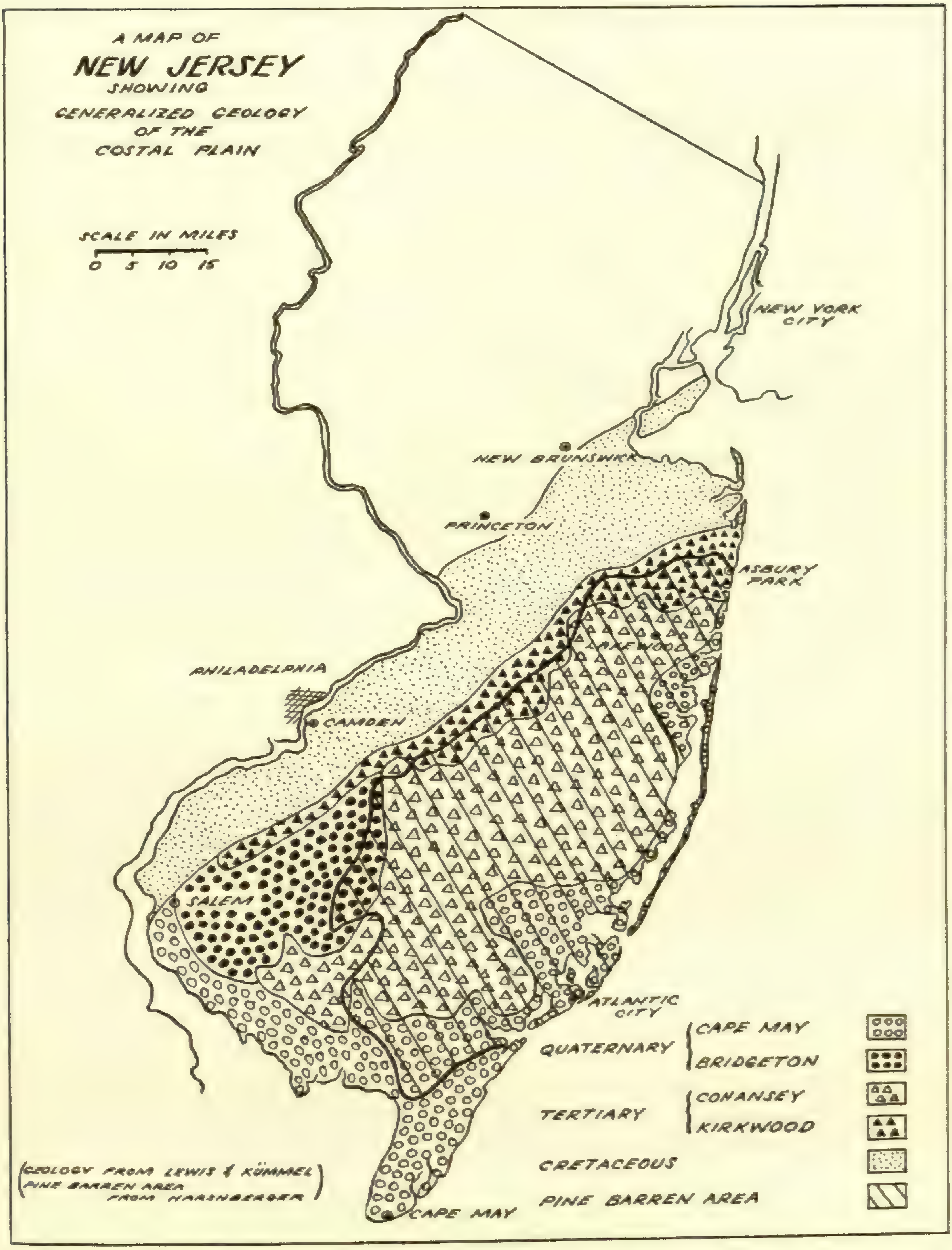

A MAP OF
NEW JERSEY
SHOWING
GENERALIZED GEOLOGY
OF THE
COSTAL PLAIN
SCALE IN MILES
0 5 10 15
NEW YORK CITY
NEW BRUNSWICK
PRINCETON
ASBURY PARK
LAKEWOOD
PHILADELPHIA
CAMDEN
SALEM
ATLANTIC CITY
CAPE MAY
QUATERNARY
CAPE MAY
BRIDGETON
TERTIARY
COHANSEY
KIRKWOOD
CRETACEOUS
PINE BARREN AREA
(GEOLOGY FROM LEWIS & KÜMMEL
PINE BARREN AREA
FROM HARSHBERGER)

Fig. 1.—The areal distribution of the Pine Barrens in relation to the major geologic formations.

the soil. In a few areas the soil materials are heavier, with resulting better soil conditions. Therefore, though the soil materials remain fairly constant, a change in moisture levels of the two terraces determines whether or not the pine-barren type of environment is present. The second phase of the lower Cape May terrace along Delaware Bay also produces good soil conditions because of lower elevations and the presence of some finer textured materials. The Delaware Bay phase of the lower Cape May formation is fluvial and marine. Erratics indicate that much of the material has been derived from glacial outwash from the Delaware Valley (5). Although it is not shown in Figure 1, this terrace in many places caps the Cretaceous along the Delaware River.

The Bridgeton formation (9) is thought to be of terrestrial, estuarine, and marine origin. Although it consists primarily of sand and gravel, it contains enough silt and clay in the matrix to result in the formation of a Gray-brown Podzolic rather than a true Podzol. The Bridgeton, except where the materials are especially coarse textured, is not included in the pine-barren area. The 10 to 20 percent of silt and clay is sufficient heavy material to prevent the formation of a highly podzolized soil in this locality. Inspection of the soil maps (1) reveals that the soils have some natural agricultural potentialities. In fact, this is one of the vegetable-producing areas of New Jersey. The silt and clay present offer a greater surface exposure per unit weight than is found in the Pine Barrens. This gives rise to better moisture relations and higher cation exchange capacity than is found in the lighter soils.

The Kirkwood formation, which roughly borders the southeast side of the Cretaceous formations, is split longitudinally by the pine-barren border. No correlation whatever exists between the areal distribution of this formation as a whole and the pine-barren vegetation. As the Kirkwood formation dips slightly seaward, the upper part of the formation is exposed toward the seaward side and the lower part on the Camden side. Kümmel (5) mentions that the upper Kirkwood is very sandy, whereas the lower Kirkwood often grades into silts and clays. Field observations substantiated this. Where the soil materials grade from the coarse textured to the fine textured, there is the line of demarcation of the Pine Barrens. To show this relationship, an area in the vicinity of Wrightstown which was selected has about the widest areal distribution of the Kirkwood, and the formation is exposed rather uniformly from top to bottom. Figure 2 shows these relationships of stratigraphy to the soils and pine-barren vegetation. The stratigraphy of the Wrightstown area along the traverse indicated in Figure 2A and B is shown in Figure 2C. Figure 2C, taken from the New Jersey Geologic Map, shows the stratigraphy of the various formations. The Cohansey, Cape May, and Upper Kirkwood have at least one important property—extreme sandiness—in common. Where the Kirkwood grades into silts and clays, pine-barren conditions cease to exist. The line of the Pine Barrens has been taken from Harshberger's (3) work. The generalized soil map in Figure 2A, taken from the U. S. Department of Agriculture

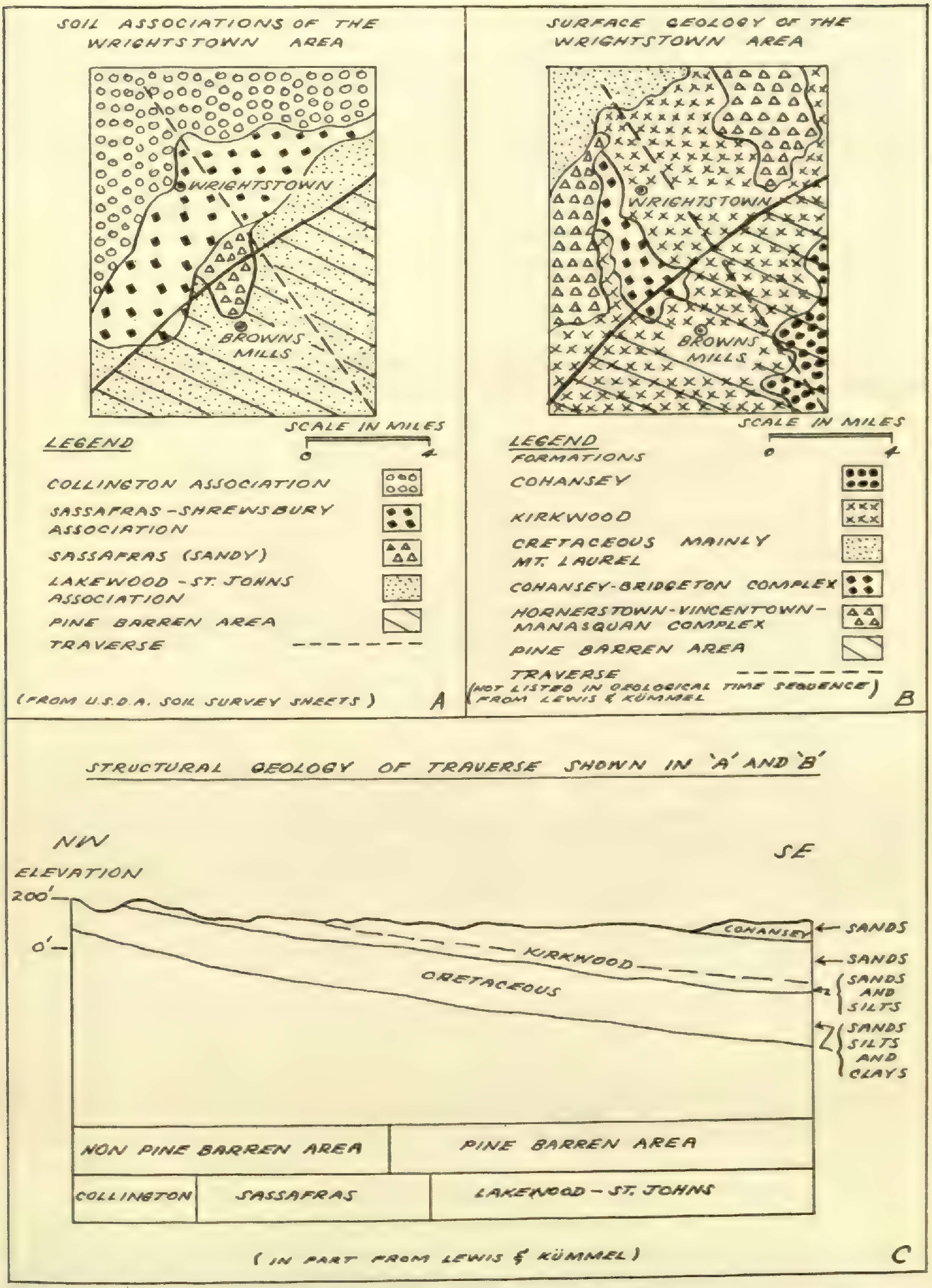

SOIL ASSOCIATIONS OF THE WRIGHTSTOWN AREA
WRIGHTSTOWN
BROWNS MILLS
SCALE IN MILES
0
4
LEGEND
COLLINGTON ASSOCIATION
SASSAFRAS-SHREWSBURY ASSOCIATION
SASSAFRAS (SANDY)
LAKEWOOD-ST. JOHNS ASSOCIATION
PINE BARREN AREA
TRAVERSE
(FROM U.S.D.A. SOIL SURVEY SHEETS)
A
SURFACE GEOLOGY OF THE WRIGHTSTOWN AREA
WRIGHTSTOWN
BROWNS MILLS
SCALE IN MILES
0
4
LEGEND
FORMATIONS
COHANSEY
KIRKWOOD
CRETACEOUS MAINLY MT. LAUREL
COHANSEY-BRIDGETON COMPLEX
HORNERSTOWN-VINCENTOWN-MANASQUAN COMPLEX
PINE BARREN AREA
TRAVERSE
(NOT LISTED IN GEOLOGICAL TIME SEQUENCE) FROM LEWIS & KÜMMEL
B
STRUCTURAL GEOLOGY OF TRAVERSE SHOWN IN 'A' AND 'B'
NW
SE
ELEVATION
200'
0'
COHANSEY
KIRKWOOD
CRETACEOUS
SANDS
SANDS
SANDS AND SILTS
SANDS SILTS AND CLAYS
NON PINE BARREN AREA
PINE BARREN AREA
COLLINGTON
SASSAFRAS
LAKEWOOD-ST. JOHNS
(IN PART FROM LEWIS & KÜMMEL)
C

Fig. 2.—*A* shows the close correlation of the Lakewood soils to the pine-barren area. When soil materials contain appreciable amounts of silt and clay, better soil conditions result. *B* shows that the Cohansey and the upper Kirkwood formations are pine-barren "materials," whereas the heavier formations give rise to more productive Sassafras and Collington soils. *C* shows the structural geology of the traverse indicated in *A* and *B*.

Soil Survey Maps, shows this same relationship. Where the soils are within the confines of the pine-barren area, they have been mapped as the Lakewood and St. Johns. Following the traverse northwesterly, where the lower Kirkwood is exposed, the soils have been mapped as the Sassafras and Shrewsbury (6, 7) series, and the limit of the Pine Barrens is at the junction of these two groups of soil series, which have widely diverging properties. Northwest of Wrightstown, where the glauconite of the lower Tertiary and Cretaceous formations is present, the Collington soil is found. Wind activity should not be overlooked. Local fine-grained deposits brought in by northwesterly and southwesterly prevailing winds may have been derived from the Cretaceous.

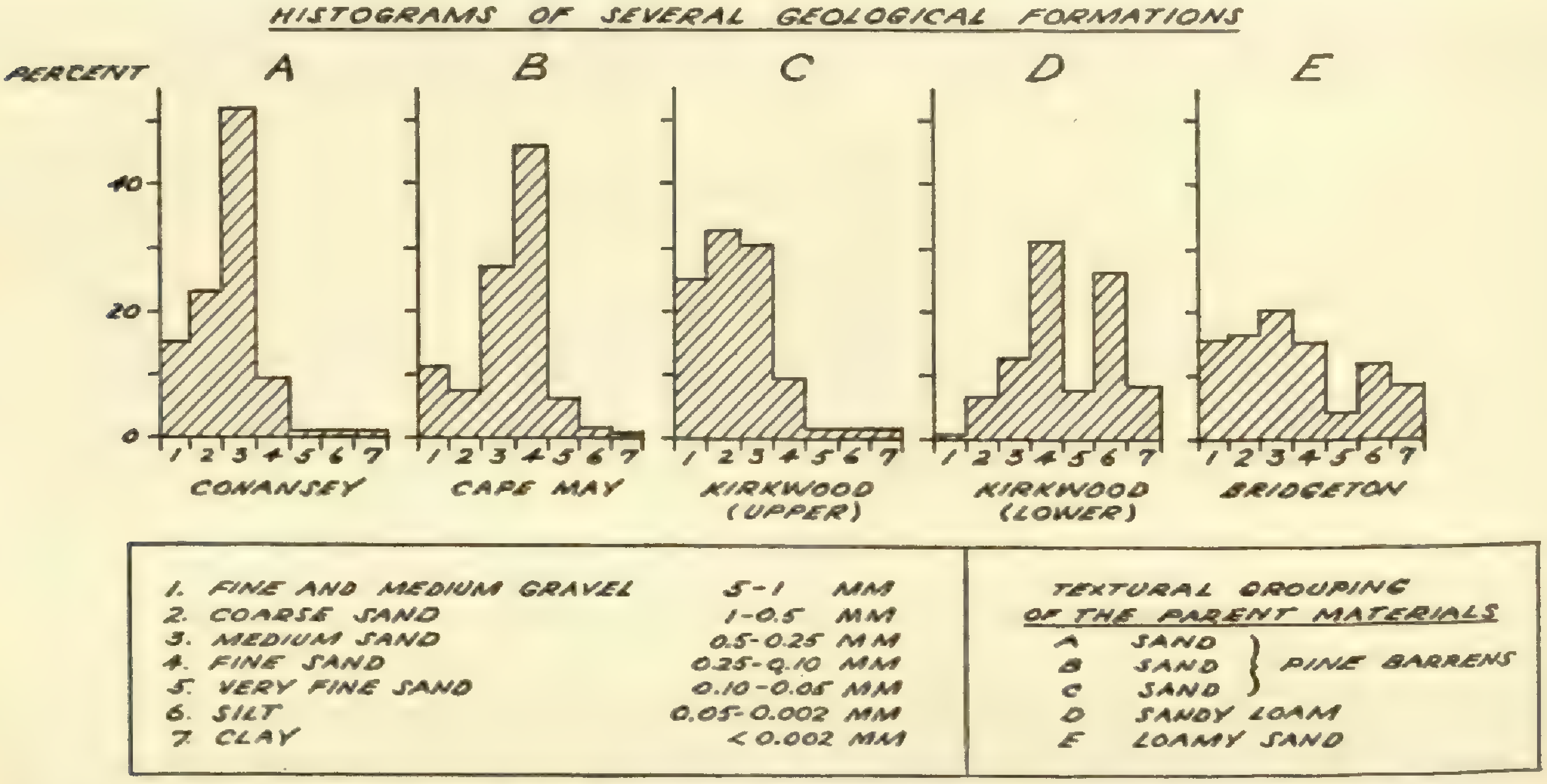


Fig. 3.—Histograms of the major geologic formations of the pine-barren area. *A*, *B* and *C* contain virtually no silt and clay and are within the limits of the Pine Barrens. *D* and *E* contain appreciable amounts of silt and clay and are not included as a part of the pine-barren area.

Figure 3 shows histograms of particle-size distribution. In the Cohansey, Cape May, and upper Kirkwood formations virtually no silt or clay is present, whereas in the Bridgeton, silt and clay total more than 20 percent. Absence of silt and clay in the former formations is thought to be an important factor in determining the pine-barren conditions.

The Pensauken formation of fluvial origin is of variable lithologic character. Just south of the town of Lakewood, where an extensive area of this formation is exposed, the soil character (6) varies with the composition of the geologic materials. Where the material is extremely sandy, typical pine-barren conditions exist, but where the materials become heavier the soils grade from Podzols to those of the better Gray-brown Podzolic group. This is evidenced by the few scattered farms throughout the area, which are covered mostly with Gray-brown Podzolic soils.

Thus if textural and moisture conditions are considered, the distribution of the soils in the Pine Barrens can be largely explained by soil characteristics. If changes in lithology and topographic position and their effect upon the soil are considered, rather than floral and faunal assemblages, the correlation is good.

Future Use of the Pine Barrens

To date these excessively drained soils of the Pine Barrens have not been cultivated to any extent, and there is no indication of any improvement in the near future. When, however, in years to come, the growing population of the nation demands greatly increased food production, then the Pine Barrens can be an important contribution to our economy. They could, no doubt, be developed as a large-scale " sand culture." Vegetables could be planted and irrigated under controlled conditions. Fertilizer could be added in the irrigation waters, analyses being varied to meet the needs of each crop. Yields could be raised to high levels in this soil by such procedures. The main uncertainty at this time is the adequacy of the ground-water supplies, the requirements of which would be enormous.

Summary

The pine-barren area in New Jersey owes its existence primarily to the character of the geologic materials from which the soil was derived. Soil type, poor moisture conditions, lack of nutrients, acidity, aluminum toxicity, and repeated fires appear to be traceable to the nature of these materials.

References

1. Burke, R. T. A. and Lee, L. L. 1926. Soil Survey of the Camden Area, New Jersey. U. S. D. A., Bur. Chem. and Soils.
2. Engle, C. C., et al. 1917. Soil Survey of the Millville Area, New Jersey. U. S. D. A., Bur. Soils.
3. Harshberger, J. W. 1916. Vegetation of the New Jersey Pine Barrens. Christopher-Sower Company, Philadelphia. 329 pp.
4. Joffe, J. S. 1932. Soil Profile Studies: V: Mature Podzols. Soil Sci. 35: 313-329.
5. Kümmel, H. B. 1940. The Geology of New Jersey. Bul. 50, Geol. Sur., Dept. of Conservation and Development, State of New Jersey.
6. Lee, L. L., et al. 1923. Soil Survey of the Chatsworth Area, New Jersey, U. S. D. A., Bur. Soils.
7. ————. 1921. Soil Survey of the Trenton Area, New Jersey. U. S. D. A., Bur. Soils.
8. Lutz, H. J. 1934. Concerning a geological explanation of the origin and distribution of the New Jersey Pine Barren vegetation. Ecology 15: 399-406.
9. MacClintock, Paul and Richards, H. G. 1936. Correlation of late pleistocene marine and glacial deposits of New Jersey and New York. Bul. Geol. Soc. of Amer. 47: 289-338.
10. Marbut, C. F. 1928. U. S. Dept. of Agriculture Graduate School Lectures. Lecture 11.
11. Salisbury, R. D. and Knapp, G. N. 1918. The Quaternary formations of southern New Jersey. N. J. Geol. Surv., Vol. 8.
12. Stone, Witmer. 1911. The plants of southern New Jersey with special reference to the flora of the Pine Barrens and the geographic distribution of the species. Ann. Rept. N. J. State Mus., 1910, 23-828.

Ground Water in the New Jersey Pine Barrens Area [1]

Henry C. Barksdale [2]

The title of this paper is "Ground water in the New Jersey Pine Barrens area", and yet it is impractical to talk very much about ground water in this area without becoming involved in the broader subject of total water supply. As a matter of fact, nearly all the available water in the area is ground water for a part of its travel through the area. The sandy character of the soil and the slight relief of the topography are such that very little actual surface runoff occurs. Even in times of very heavy precipitation nearly all the water that reaches the land surface sinks into the soil without traveling far across its surface. A substantial part of this water subsequently finds its way underground into the stream channels. Let us therefore think of the total water supply from the area and of the best means for its development, rather than engage in the futile attempt to separate it into ground-water and surface-water components.

The Pine Barrens area is the interior part of the New Jersey coastal plain that seems best adapted to the production of oak-pine forest. It is not an uninterrupted and continuous area but extends roughly 100 miles in a northeast-southwest direction, and its maximum width is about 40 miles. According to Little [3] its area is approximately 1.3 million acres, which is equivalent to about 2,000 square miles. It has long been recognized that this vast interior section contains one of the State's major sources of water supply, but thus far it has remained essentially undeveloped.

Sandy soils are characteristic of the area. They are generally derived from the geologic formations that immediately underlie them. The greater part of the area is underlain by the Cohansey sand, which is composed predominantly of sand although it includes some lenses of clay. Much of the remainder is underlain by the outcrop of the Kirkwood formation, which in this area is also composed largely of sand, although farther down the dip it becomes more clayey. Furthermore, even in parts of the area where the underlying major geologic formation may have clayey facies, there is often a veneer of sand and gravel of Pliocene or later age that ranges in thickness from a few inches to many feet. All these formations produce sandy soil which readily absorbs water, particularly on the gentle slopes that occur in the Coastal Plain. Generally the sandy materials beneath the soil are thick enough to provide very substantial storage capacity and to transmit water readily.

---

[1] Publication authorized by the Director, U. S. Geological Survey.

[2] District Engineer, Ground Water Branch, U. S. Geological Survey.

[3] Little, S., The effects of forest fires on the stand history of New Jersey's pine region: Northeastern Forest Exper. Sta., Forest Management Paper No. 2, p. 2, February 1946.

We are all familiar with the basic concept of the hydrologic cycle—the rising of water vapor from the surface of the sea and of the land under the influence of the sun's rays, its movement through the atmosphere, and its subsequent return to the surface of the earth as precipitation. This is the source of all our water supply. Not all the water that falls on the surface of the land, however, is available for water supply. There are certain detours and short cuts back to the atmosphere that have first call upon the water which falls as precipitation and over which we have relatively little control. Some water is evaporated into the lower atmosphere even as it falls. Some is intercepted by the leaves and stems of plants and by litter on the land surface and is subsequently returned to the air. Of the water that actually reaches the land surface, a portion (a very small portion in the Pine Barrens area) runs off directly into streams and the remainder sinks into the soil. Even here it is not all available for water supply, because a substantial part of the water that enters the soil is subsequently returned to the atmosphere by evaporation and transpiration. The remainder percolates down to the water table and, together with the direct runoff to streams, becomes available for water supply.

The total annual precipitation in the Pine Barrens area ranges from 42 to 45 inches; of this only about 20 inches, or an average of about 1 million gallons a day per square mile, is available for water supply. It should be emphasized that this represents the *total* available water supply, both surface and underground, and that it could not all become available without storage adequate to hold back all runoff from the area through both surface streams and underground percolation. Such perfect storage is rarely, if ever, available. Neverthe less, the 2,000 square miles of New Jersey Pine Barrens is certainly capable of yielding substantially more than a billion gallons of water daily for an indefinite period. The yield possibly might be increased somewhat by agricultural or silvicultural practices that would tend to reduce interception, or by a reduction in evapotranspiration caused by the artificial lowering of the water table in the course of the development of the area.

The water supply from the Pine Barrens area has remained essentially undeveloped up to the present time. This is primarily because the communities around the periphery of the area thus far have been able to obtain all or most of the water they needed from sources nearer to them, and proposals to deliver the water at greater distances have not materialized. An early plan to develop water in the Pine Barrens area for the city of Philadelphia was abandoned because of a statutory prohibition against exporting water from the State. Proposals to develop water in this area for use in the northern metropolitan area of the State have not been carried out because the high cost of transmitting the water has made the proposal less economical than others. With the present great industrial development along the Delaware River on the one side and the increasing demands of the resort areas on the other, it now seems probable that some of the water from this area may be required in these adjacent areas.

The effective development of this great water supply cannot proceed along the familiar lines of large surface reservoirs and their attendant works because the low relief of the area provides no good sites for great reservoirs. A large-capacity surface reservoir in the Pine Barrens area would necessarily be a huge shallow basin with swampy margins. This would create many problems in the treatment of the supply, and result in large losses to evaporation and transpiration.

Fortunately, the sands themselves provide a reservoir vastly greater than any ordinary surface reservoir. The specific yield of the excellent water-bearing formations in the Pine Barrens area is conservatively estimated to be in the order of 20 percent of the volume of the sands themselves. The volume of the sands is tremendous. To a considerable degree this reservoir is protected from bacterial contamination by the sands above the water table, which act as a filter, and except where the water table is shallow it is fairly effectively protected from losses to evapotranspiration.

The development of a water supply from the Pine Barrens area should be based upon a carefully distributed pattern of wells and a branching system of collection mains to conduct the water to areas of use. Supplementary or emergency use might be made of intakes on the major streams of the area, but the entire operation should be planned in a manner that will make the maximum use of the great natural reservoir provided by the water-bearing sands.

It is usual in the development of major water supplies to take elaborate precautions to protect the quality of the supply. Sometimes the use of an entire watershed upstream from a surface reservoir is restricted in order to protect the water supply. The water supply from the Pine Barrens area must likewise be protected from contamination lest its usefulness be impaired or even largely destroyed. It would be difficult to accomplish this and at the same time locate industrial establishments and their attendant residential communities within the Pine Barrens area itself. Such a procedure would make it necessary to construct new facilities for transportation and new communities in order to provide a labor supply. It would also create problems in the disposal of the wastes produced by the various industrial and municipal establishments which would tend to percolate downward and contaminate the water supply, thereby reducing the total amount of good water available. A more intelligent program would seem to be the retention of the major part of the Pine Barrens area for its present agricultural or forestry uses, and the use of the water along the periphery of the area where facilities for its use can most easily be established or enlarged. As the marginal areas develop, the Pine Barrens area would not only be a continuing source of large quantities of pure water, but would have increased value for recreational, agricultural, and forestry purposes.

The Pine Barrens area contains the last great essentially untapped source of good water within the State of New Jersey. Already the people of New Jersey have developed and are using something between one-tenth and one-fourth of the State's total water-supply potentialities. It is not too soon to act decisively for its preservation and protection.

The Place of Fire in the Ecology of Pines

H. H. CHAPMAN

Professor Emeritus, Yale University

ABSTRACT. While man is responsible for a many-fold increase in the occurrence of forest fires, lightning as a natural cause has operated with a frequency that places fire among the determining ecological factors that influenced development, modification, and survival of species, especially of pines.

In dry hot climates lightning fires occurred at intervals so short that pines became modified in order to survive as seedlings or saplings. In cooler northern climates fires tended to destroy most of the stand, and adaptations took the form of protecting seed sources.

To successfully reproduce and grow pines we must adapt silvicultural measures to the inherent habits of each species of pine, as determined for it by the environment in which it has developed the adaptations.

This is difficult with some northern species such as white pine (*P. strobus*) and jack pine (*P. divaricata*). The reasons for these difficulties are chiefly the fact that clear cuttings, even with seed sources, do not usually duplicate natural conditions under which these pines originate, hence special skill and often considerable expense is involved.

With southern pines, the duplication of natural conditions is extremely practical and inexpensive, consisting of the use of prescribed controlled fire at intervals dependent on the species; 3 years for longleaf pine (*P. palustris*), 5-6 years for slash pine (*P. caribea*), and 8-10 years for loblolly pine (*P. taeda*). This practice not only insures abundant reproduction during seed years but fireproofs the forest against almost certain destruction as the result of excluding fire and building up an unnatural fire hazard of brush and dead grass. The extension of the use of prescribed fire to the shortleaf (*P. echinata*) and pitch pine (*P. rigida*) types in New Jersey is an outgrowth of the practices found successful and officially adopted by the Forest Service in the southern pines.

Fire is usually thought of as practically created by man, and its occurrence in the forest as man-caused. Actually, fire has been a natural phenomenon independent of men every since there was inflammable vegetation on earth, a period greatly exceeding man's existence. The prevailing cause is lightning. While usually accompanied by rain, there are circumstances and conditions which permit lightning to set fires in forest, brush, and grass cover, which are not extinguished by rain, and which may cause numerous, frequent, and extensive conflagrations where these conditions are favorable.

The favoring conditions are the occurrence of "dry" thunder storms, and the presence of dead snags or other fuel, which may ignite and burn, screened from rain, until the fire can spread.

Natural or normal occurrence of fire in the forest varies greatly with the region and climate, but practically no large region or forest type has been entirely free from lightning fires, the most nearly immune perhaps being the northern hardwood type, beech, birch, and maple.

For types subject to natural fires we can make two clear divisions, first, those which normally grow to maturity without fire and are usually completely killed when it does occur, but then reproduce themselves from seed sources, that escape destruction. The second division consists of species exposed to such frequent natural fires that they would normally be destroyed in their early growth were it not for special adaptations that enable the young seedlings and saplings to pull through, and develop fire resistance.

The character of natural fires in the first of these classes is apt to be severe, frequently a crown fire, very destructive, and creating even-aged conditions where reproduction succeeds in establishing itself after the fire. Climatic conditions and ground cover in such regions and types are such as to maintain moisture and shade on the forest floor, where all fires start. Only in exceptional droughts, with high winds, do conditions permit these infrequent burns, hence the general habits of the tree species are accommodated to fire but once in a tree generation. Wind may be a primary cause of fire by first levelling great stretches of old timber, exposing the soil to sun and air movement, and thus setting the stage for a lightning fire.

The natural provisions for reseeding consist, for white pine, of great longevity of the species, and increasing wind and fire resistance of veterans, whose survival gives the source of seed. The tender, slow growing seedlings are usually protected by grass and brush shade during the first few years, and on soils not too favorable for hardwoods, come to maturity.

For red, or Norway, pine, a greater and earlier fire resistance is attained by the resistant character of the bark. This is coincident with drier sites and more frequent fires.

For jack pine, bark seldom protects the species from destruction by fire, and the means of reproduction are found in closed cones, opening in the heat of a fire, and in very early production of cones.

The influence of man on natural reproduction in this class of forest types consists first of reducing or eliminating the seed sources, second of creating widespread exposure and extreme conditions for ground fires, by clear cutting, and third, in enormously increasing the incidence of fire far in excess of natural occurrence, and under aggravated conditions for spread and damage. It was logical therefore, to conclude that fire in the forest was wholly destructive and its complete prohibition a first step in forest management.

This general rule in fact was taught as having universal application regardless of type and region, until it came to be known that for certain species, types, and climates, exclusion of fire created abnormal conditions detrimental to forestry practice. These abnormalities consisted first, of preventing successful reproduction of desired species, especially of pines, and second, they created an increasing hazard leading to uncontrollable conflagrations which destroyed types that were adjusted to frequent ground fires but not to crown fires. In this class fall the species growing in the drier, hotter regions, such as southern pines, and in the west, ponderosa pine.

When forestry practice undertook to manage land so as to reproduce northern pines intentionally, it was evident that nature's provision for perpetuating these species would be difficult to adopt as practical measures. The enormous increase in white pine on abandoned farms in New Enland was due to pure accident. The stumps and roots of competing hardwoods had been eliminated by culture, leaving no effective competition, and grass gave the seedlings the required protection against sun scald. Pure stands took the place of the formerly scattered veterans that had furnished the seed. When these stands in turn were clear cut, thick duff had formed inhibiting grass, and seedlings perished from lesions due to excessive temperature, during the first few months. Partial or shelterwood cutting by preventing these temperatures permits survival in the absence of dense advance reproduction of understory hardwoods. Thus despite the fact that practically all extensive stands of white pine in the Lake States and northeast were even-aged and probably the result of former fires, it is by no means certain that this species can be reproduced naturally by attempting to repeat this process on any large scale. The relations of aspen to white pine are an example of how logging operations have changed natural conditions to increase the difficulty of following nature's normal procedures. In the virgin white pine-northern hardwood-hemlock forests the aspen was a fugitive tree, scarce in numbers. When openings occurred, seed, blown for long distances usually reached the spot but the resultant stand, of seedling, not sprout, origin must have been rather sparse and open. At any rate, decadent aspens are practically always found in even-aged stands of second growth white pine in natural sites, disappearing at 80 to 90 years. But on cutover lands, frequently burned, the aspen took full possession by seed and sprouts. White pine seedlings were killed out by suppression. The natural succession was destroyed. This occurred on the Minnesota National Forest, even in the absence of subsequent fires. The problem of restoring white pine on lands taken over by dense aspen has not been satisfactorily solved. The conclusions must be that while fire may have a future place in preparing the site for white pine regeneration it is not a panacea. Successful reproduction and survival of this species in competition with hardwoods is largely dependent on soil. When soils are too dry and sandy for hardwoods the chances for pine are correspondingly improved. There is evidence too, that white pine on such sites may alternate with hardwoods, as scattered individuals or groups, by becoming established under shade when the latter reach mature sizes.

Jack pine presents an even more fascinating problem. These stands, after their origin, develop without fire until they are cut, or are killed by fire. The duff layer is therefore intact, and from 50 to 100 years old. No seedlings ever survive on this duff, when exposed to the sun. But neither do they survive on bare soil, in the absence of some shade, since the temperatures on the surface become lethal for the young seedling. Nature solved this problem by removing the duff through fire, which left the ground occupied by the dead boles of the former stand. The seed, released from accumulated closed cones, germinated in the ashes and the seedlings were then protected from lethal heat by the revolving shadows of the rampikes or snags. Overdense reproduction normally was established.

This procedure cannot well be imitated by man. Instead, the duff must first be churned up by disc plows, or torn up by skidding whole trees, then the cone-bearing tops must be lopped and scattered, first to provide shade, second to bring the cones within 6 inches of the ground, where sufficient heat will develop to open them. Shade of brush will kill off the seedlings. Dead and charred trees cannot be used for pulp. So in this case, the natural use of fire may not be feasible and these less effective measures substituted.

The problem of reproducing and growing southern pines really includes the pitch pine, with shortleaf pine associate, extending through New Jersey, and into southern New England, where white pine takes the place of shortleaf in the original forest composition. The problem throughout this entire region of southern hard pines, is that of growing pine instead of hardwoods. The natural hardwood associates of these pines are quite fire resistant, consisting mostly of scrub oaks. In addition, due to dry sandy soils, there has developed a ground cover of very inflammable grasses and shrubs which dry out so rapidly after rain that within an hour a hot fire can be on its way. There are three distinct conditions present over this southern pine belt, each characterized by a different species of pine. In each of these situations fire is a controlling element, and the survival of the species of pine present is due to a complete adjustment to this controlling element, namely, to average frequency of fires set by lightning. For the longleaf pine this frequency has been statistically demonstrated to be three years.[1] Hence, the longleaf seedling develops no stem above ground for 5 to 6 years, and when it emerges the stem is an inch thick with thick bark. It also stores food in the root and can thus produce a new crop of needless when completely defoliated by fire. It can stand no shade whatever, and is subject to a needle blight. Fire kills its competitors, hardwood sprouts and other pines, and disinfects the area, thus permitting it to survive. So this species is completely dependent on burning at 3-year intervals for its existence. Not until these facts were known and applied was any success attained in reproducing longleaf pine. These fires keep down the scrub hardwoods if used at this 3-year interval.

---

[1] Chapman, H. H., Lightning in the Longleaf, Amer. Forests **56**: 10-11 (1950).

Loblolly pine seedlings grow on a better and moister class of soils and do not attain fire resistance until they are 6 to 8 years old. They are killed out on natural longleaf sites by too frequent fires. If fire is kept out, loblolly will always kill longleaf pine and take over the site, producing less valuable stands than longleaf. On its natural site, it has a somewhat better class of hardwoods as competitors. But these hardwoods are still of inferior quality and unprofitable to grow as substitutes for pine. Hence, hardwood competition must be eliminated on loblolly pine sites.

Reproduction of loblolly pine will not ordinarily survive if it originates under dense hardwood sprouts 2 or more years old. It dies out, leaving the hardwoods. To prevent this, the cutover land must be supplied with seed trees, and burned severely in the late summer of a seed year to kill back the hardwoods under 2 inches, while those too large to be killed by fire must be cut, poisoned or girdled. The pine will then in every case dominate the hardwoods and make the crop. At 8 to 10 years of age, fire must again be used to kill out the invading hardwood understory, which if left to develop survives pine shade and robs the pine of soil misture. Then when the pine is cut, the hardwoods take over unless eradicated at considerable expense.

Slash pine naturally grows in places subject to flooding, or swamps. Its seedlings are slender and grow rapidly to compete with grass and shrubs. The natural fire interval is 5 to 6 years, or longer by which time the seedlings have developed a resistant bark and may survive the fires that burn over these wet areas in a drought. The exclusion of fire from adjoining longleaf lands results in extension of slash pine in dense thickets, outside its natural site. These abnormal stands require thinning at a very early age, and are subject to a rust which has oak as its alternate host, thus creating a serious problem of management. Slash pine reproduction is favored by initial burns to clear out brush and other vegetation, and is later protected by prescribed fires beginning in the 6th year, at 3-year intervals.

The relation of shortleaf pine to fire has not been so well known, until the recent work of Moore and Little in New Jersey. Lutz has shown that the pine barrens of this state are the result of too frequent fires. The fertility of the soil is not reduced by these fires, here or anywhere else within the southern pine range. Once reduced to sprouting by these fires, the pitch and shortleaf pines have difficulty in regaining their normal growth. The hardwood sprouts, comparatively worthless, gain ascendency. The regime of prescribed burning at short intervals to keep these sprouts killed back and prevent destructive fires that kill the sapling pines has been conclusively demonstrated. It requires a high degree of technical skill to time the fires as to frequency, in such a manner that pine seedlings can be grown to the stage of effective resistance to winter burns, and the hardwoods kept down.

It is quite possible, by either too frequent fires or by efforts at total exclusion of fire, to eliminate future crops of all of these southern pines and substitute for them a growth of inferior hardwoods that will not return the cost of management. On the other hand, intelligent use of prescribed fire is capable of producing crops of pine greatly exceeding in yields per acre and value those which nature, uncontrolled by science, has grown during the past ages since these species first adjusted themselves to survival in the presence of lightning fires. What man can destroy by heedless neglect of natural laws, he can also improve on by bending these laws to his advantage.

Silvicultural Objectives and Methods on Upland Sites in the New Jersey Pine Region[1]

S. Little

U. S. Forest Service

Present Stand Conditions

Stand conditions in the New Jersey Pine Region vary widely.

At one extreme there are the Plains stands, which are composed predominantly of sprouts of pitch pine (*Pinus rigida*), bear oak (*Quercus ilicifolia*), and blackjack oak (*Q. marilandica*). Professor Lutz's study (*6*) showed that recurring, killing fires at about 8-year intervals were the primary factor in producing this type of growth. These fires may have eliminated shortleaf pine (*Pinus echinata*), and such arborescent oaks as black, white, and chestnut oak (*Quercus velutina*, *Q. alba*, and *Q. montana*), because these species do not bear viable seed at an early enough age to perpetuate themselves under such conditions. Slow recovery and growth of Plains vegetation is affected, too, by such secondary factors as injury by insects (principally Nantucket pine moth, *Rhyacionia frustrana*), deer browsing, the competition of a large number of sprouts from individual stools (as many as 249 on a single stool), and injuries by people gathering pine cones and Christmas greens (*1*).

In other stands of pitch pine and scrub oaks the wild fires have burned less frequently or less intensely, so that the pines have had a chance to develop to a larger size than on the Plains areas (*1*).

More common than mixtures of pitch pine and scrub oaks, which occupy about one third of the upland sites, are stands in which arborescent oaks, pitch pine, or shortleaf pine predominate.

---

[1] This paper was illustrated by Kodachrome slides.

The usual stand conditions are characterized by a fairly dense understory predominantly of oak sprouts and a scattered overstory in which pines predominate. However, both pines and oaks are often present in all size classes. The usual oak-pine stands are considered to represent a rough equilibrium reached as a result of wild fires or heavy cuttings at intervals of 25-50 years. The cuttings or fires have usually created relatively open conditions, but the vigorous sprouting of the hardwoods has prevented any major increase in the proportion of pine. On the other hand, the greater resistance of the pines to fire injuries has generally permitted more of them, than of the hardwoods, to survive the wild fires (*1*).

Far less common than the oak-pine mixtures are the few nearly pure stands of pine. These are nearly always found on old-field sites.

Other stands contains few or no pines. Usually these stands are young and originated as sprouts. Very rarely are there stands that might typify the oak-hickory climax.

Present and Potential Growth

Because of the heavy cuttings and wild fires during the last 200-300 years, stand compositions in the Pine Region have apparently been greatly altered. From what information I have been able to gather the original stands were predominantly pine and had a very scanty understory (*1*).

Similar stands, although managed on a relatively short rotation for products of a much smaller size, are the foresters' objective on upland sites. Such stands —if of seedling origin and never damaged by intensely-burning fires—would probably produce, as the old-field stands have, about 35 cords in 40-45 years. If profitably thinned for pulpwood at 25-30 years, the total yield would average about a cord an acre annually during the rotation.

Such growth is much more than the present stands are producing. The pine-scrub oak stands have an annual growth of possibly 1/10 cord per acre. Oak-pine stands grow about ¼ cord an acre annually, but because of wild fires the net growth in both types of stands is far less than those estimates.

Hence, the potential growth in the Pine Region is apparently 10 times what the present stands are doing.

Management Methods

Early Methods. For nearly 30 years foresters have attempted to improve upland stands in the New Jersey Pine Region by increasing the proportion of pine seedlings.

Early efforts concentrated on planting nursery-grown pine seedlings. Several species not native to southern New Jersey, as well as the native pines, were tried. None have done well. The best results were on old-field sites, but even there the best plantations are apparently relatively short-lived, because root rots (principally *Fomes annosus*) have favored heavy losses by windthrow. Plantations in the naturally wooded sites have been even less successful and very costly. Usually one or more replantings were necessary, and several costly cleanings have been needed to make the pines dominate the native vegetation.

Between 1937 and 1941 machinery was used in several areas to prepare seedbeds suitable for natural reproduction of the native pines. Some areas were plowed, some disked, some both plowed and disked and the hardwood stumps removed. The results were very good in some of the areas. In one area 9 years after treatment there were 10,000 pine seedlings per acre, and the dominants were 14 feet tall. But those areas were exceptional. Where hardwood stumps were not removed, hardwood sprouts soon dominated many of the areas. Where the hardwoods were uprooted, shrubby or herbaceous vegetation, and not pines, restocked some of the areas. For best results machinery apparently has to be used in years when good crops of pine seed will mature and be distributed on the treated areas. Furthermore, the use of machinery is costly.

Prescribed Burning

At the present time prescribed burning offers the best possibilities for providing conditions suitable for the establishment of natural stands of pine seedlings.

The type of fire so far recommended for use is a light, winter fire. Such a fire does not consume all the duff, but does reduce the amount. The use of several such fires greatly changes understory and seedbed conditions. The relatively tall understory of blueberries and huckleberries is reduced in height and amount; the amount of herbaceous vegetation tends to increase, though not appreciably under unthinned stands. The improved seedbed conditions favor a gradual increase in the amount of pine reproduction, even though fires do kill or kill back reproduction already present.

Such changes are highly important in greatly reducing damage by any wild fire, and also in modifying stand composition after cutting.

For example, 5 years after a heavy cutting that removed all oaks from an oak-pine stand the pine reproduction per acre was 520 on areas unburned in the 10 years before cutting, 1,175 on areas burned once in that period, 1,490 on areas burned twice, 1,980 on those burned 3 times, 2,740 on those burned 4 times, and 3,765 on the areas burned 5 or 10 times.

The use of light winter fires is most effective in changing stand composition the more burns have been made and the older are the overstory oaks. In relatively young stands it is possible to provide highly favorable conditions for the establishment of pine seedlings, but the initial rate of growth of shortleaf and pitch pine seedlings is so slow, especially when retarded by the deer browsing common in New Jersey, that these seedlings cannot match the rate of growth of the oak sprouts. In older stands where there are fewer overstory oaks and more stumps fail to sprout after cutting, the proportion of pine in the stand can be greatly increased by prescribed burning before cutting.

Hence, at the present time we consider that prescribed burning, which can be usually done for 10-40 cents an acre per burn, is a major tool in the management of upland stands in the Pine Region (*2*, *3*, *4*, *5*, *7*). This has to be supplemented by proper harvest cuttings that favor the establishment of pine seedlings in even-aged stands. Cleanings or the use of poisons to favor the dominance of pines over hardwoods are highly desirable, but costly.

Even though the New Jersey foresters do believe that we should handle the forests in even-aged stands, I probably should point out that they do not desire large areas with stands of one age class. Instead, they are planning for a mosaic of stands of different ages, and the area in one stand will not usually be more than 100 acres, even in the large holdings. Of course, in the smallest holdings the area in one stand may be only a few acres.

LITERATURE CITED

1. Little, S. 1946. The effects of forest fires on the stand history of New Jersey's pine region. Northeast. Forest Exp. Sta. Management Paper 2 (Processed), 43 pp., illus.
2. Little, S., J. P. Allen and E. B. Moore. 1948. Controlled burning as a dual-purpose tool of forest management in New Jersey's pine region. Jour. Forestry 46: 810-819, illus.
3. Little, S., and E. B. Moore. 1945. Controlled burning in South Jersey's oak-pine stands. Jour. Forestry 43: 499-506.
4. ————. 1949. The ecological role of prescribed burns in the pine-oak forests of southern New Jersey. Ecology 30: 223-233, illus.
5. ————. 1950. Effect of prescribed burns and shelterwood cutting on reproduction of shortleaf and pitch pine. Northeast. Forest Exp. Sta. Paper 35 (Processed), 11 pp.
6. Lutz, H. J. 1934. Ecological relations in the pitch pine plains of southern New Jersey. Yale Univ. School of Forestry Bul. 38, 80 pp., illus.
7. Somes, H. A. and G. R. Moorhead. 1950. Prescribed burning does not reduce yield from oak-pine stands of southern New Jersey. Northeast. Forest Exp. Sta. Paper 36 (Processed), 19 pp.

Controlled Burning—its Broader Ecological Aspects

JOHN E. CANTLON and MURRAY F. BUELL

George Washington University and Rutgers, the State University of New Jersey

Dr. Chapman's concluding remarks might well be used as the introductory statement for our brief comments on the broader ecological aspects of controlled burning in New Jersey's Pine Region. He has said, " What man can destroy by heedless neglect of natural laws, he can also improve on by bending these laws to his advantage " (Chapman '51). Obviously, if man had made no attempt to upset natural laws and equilibria he would not have advanced beyond the early stone age. Most of our agriculture, industry and commerce, of necessity, upset natural laws. Complete ignorance of or indifference to these laws, on the other hand, result in catastrophies and waste of a magnitude that man can little longer afford.

Modern students of conservation and land use are fully aware that the more nearly we attempt to remain within the natural framework the fewer our conservation problems. The " bending ", as Dr. Chapman puts it, of these laws has, as a matter of fact, permitted us to make sustainable increases in our yields in forestry, grazing, agriculture, and in certain cases in wild life production.

When we set about to " bend " natural laws, it is essential that we guard against a myopic view point. The complete focusing of our attention on one phase of the complex of interacting processes that operate in any natural area may produce future problems that a little foresight would prevent. Thus, it is important that we examine in detail as many of the effects produced by the interference with natural laws as we are capable of observing. In the last analysis, what now appears to be an insignificant change may, in the future, turn out to be of great importance.

As we have just heard from Drs. Little ('52) and Chapman ('52), controlled burning seems to be the answer to the problem of increasing the yields of forest products in the pine region of New Jersey. If it becomes apparent to the land owners that it is economically sound to use the technique for producing more valuable stands of pine, controlled burning may become a wide-spread practice in the region. With this possibility on the horizon it may be wise to inquire into the influence of its expanded use on the broader ecological relationships of the region. Thus, for the past two years the present authors have been cooperating with certain of the groups interested in the region in attempting to outline some of the changes that appear to warrant further investigation.

The pine region of New Jersey covers approximately 2000 square miles, most of which is forest growth. Upland forest capable of being managed by prescribed burning occupies somewhat more than one-half of this area. The silvicultural goal would be to convert the present highly variable and low-value stands of mixed oak and pine to many small blocks of relatively pure pine. In addition to this change of dominants in the tree layer, the shrub, herb, moss and litter layers of the plant community will also be modified by the management practices. What effects may be anticipated from these changes?

If we consider the tree layer, it is at once clear that the practice results in changing the tree canopy from broad-leaved, winter deciduous to needle-leaved evergreen. What will be the influence of such a change on the hydrological relationships in the area? The work of Hoppe ('96), Horton ('19), Mitchell ('30), and Beall ('34) indicates that in general, evergreen needle foliage permits less precipitation to penetrate the tree canopy than broad-leaved deciduous foliage. Kittridge ('48), on the other hand, makes the generalization that the nearer the vegetation to climax the greater the interception loss. For the pine region, where oak is more nearly climax than pine, this would appear to be in disagreement with the results of the investigators cited above.

As to data from the region in question, they too are in disagreement. Wood ('37) found no difference in throughfall under oak as compared to pine foliage. Preliminary observations by the present authors, however, indicate that there may be a significant difference in the interception qualities of the two canopies. During 25 storms in the summer of 1950 throughfall was 87% under oak canopy and 81% under pine canopy.

It seems clear that the hydrological aspects of the management plan need further study. Of particular interest would be the evaluation of interception loss and water consumption values for the two vegetation types for all seasons of the year and in all stages of the management plan. Also, the hydrological influences of the shrub layers may be of importance. With water supplies becoming more critical to agriculture in and around the area, and to surrounding metropolitan centers, the hydrological aspects of such a land management plan should receive some careful thinking. Mr. Barksdale has discussed this problem in more detail (Barksdale 1952).

From studies in the Forest Service experimental plots that have been subjected to controlled burning, it has been found that marked changes occur in the lower vegetation layers following burning and cutting (Buell and Cantlon '52). The effects of these changes on the ecological relationships in the area also need careful evaluation. Burning and subsequent cutting appear to result in a marked reduction in total shrub cover and a shift in the importance of the shrubby species. Following this treatment, the cover of huckleberry, *Gaylussacia baccata*, is reduced to a much greater extent than that of the lowbush blueberry, *Vaccinium vacillans*. During the phase of the management program when fire is excluded to enable pine reproduction to become established, the lowbush blueberry makes a much more vigorous comeback than does the huckleberry. This shift in dominance may, over long periods of such management practices, be accumulative.

Just what influence a much greater abundance of this species may have on the two agricultural industries devoted to growing other species of *Vaccinium* may be worthy of further investigation. For example, do the pathogens, vectors of pathogens, or insect pests of the domestic cranberry or blueberry also find harbor in the wild lowbush blueberry? If so, will tracts of surrounding upland continually becoming purer stands of this species complicate control measures?

From the literature on plant diseases one gets glimpses of the possible relation that prescribed burning may have to blueberry and cranberry diseases. Demaree and Wilcox ('47) state that, " The lowbush species (of *Vaccinium*) often form dense clumps, or grow thickly over wide areas on uncultivated lands where there is little competition by larger shrubs and trees. In such situations pathogenic fungi find conditions favorable for rapid spread. Severe leaf infections resulting in extensive preharvest defoliation sometimes occur in wild growth of low bush species of *Vaccinium angustifolium* and *V. myrtilloides* in Maine and *V. vacillans* and *V. pallidum* in more southern regions. . . . It is not unusual for cultivated blueberry fields to be surrounded by forests, swamps, or cut-over lands where wild blueberry bushes form a portion of the flora, a condition very favorable for the spread of the diseases from the wild to cultivated fields ". Two pathogens mentioned by these authors as having a very wide host range in the genus *Vaccinium* are the powdery mildew, *Microsphaera alni* D. C. ex Wint., and a rust, *Pucciniastrum myrtilli* (Schum.) Arth.

Other studies indicate a somewhat different possibility for certain phases of the prescribed burning program. In Maine fire is used in blueberry culture as a form of pruning to stimulate new growth. The fields are burned over every few years in the spring. Markin ('43) found that although the burning did not eliminate diseases, it does to some extent control the red-leaf disease (caused by species of *Exobasidium* which also occurs on *Gaylussacia baccata*) and reduces the prevalence of leaf spot (caused by *Septoria*). Although the culture methods for New Jersey blueberries are very different Markin's results suggest that the reservoir of disease in the wild population may be reduced by burning.

From another point of view, will purer stands of lowbush blueberry occurring during the fire exclusion period offer critical competition for pollinating insects essential for successful fruit set in these two industries; or will it result in an increase in the supply of such insects by lengthening the period when flowers are available for insect food gathering? These are aspects of the forest management plan that may be worthy of investigation by the entomologists and pathologists connected with the cranberry and huckleberry industries.

The frequent and long-continued consumption of the litter and dead shrub stems forms an important part of the silvicultural plan. The resultant reduction of fire hazard and the provision of a suitable pine seed bed are essential to the establishment of the pine stands desired. What other influences are exerted by the removal of this organic layer?

Pearse ('34) found that when the litter is burned, soil organisms are reduced to one-third of the number present when the litter is not so removed. Certain of the bumble bees (*Bombus*) important as wild pollinating insects in the cranberry and blueberry industries are soil nesting and hibernating insects. Dr. Robert S. Filmer, however, in correspondence with one of the authors, indicates that the two most abundant species in the region (*Bombus impatiens* and *B. bimaculatus*) are deep nesting types. May not these species owe their relative abundance to their deep nesting and hibernating habits in this historically fire ravaged area?

Other inhabitants of the litter are also worthy of consideration. For example, it is generally known that virus diseases are often transmitted by insects. Anything that reduces the vector will have a favorable effect on the incidence of the disease. Tomlinson, Marucci, and Doehlert ('50) recently reported that two species of leafhopper (*Scaphytopius magdalensis* and *S. verecundus*) transmit the virus causing blueberry stunt disease. These leafhoppers winter over in the egg stage in fallen leaves. Might not the practice of frequent burning of the litter in the wild vegetation significantly reduce the leafhopper population in the areas surrounding the plantations?

At present we do not know which of the soil organisms in the pine region would be sensitive to the burning frequency necessary to the silvicultural program. We need much more study of the relationships between soil and litter dwelling organisms and controlled burning.

We have long been subjected to the idea that fire produces a marked acceleration in soil erosion mainly through the removal of the litter layer. In the pine region, however, erosion can practically be ignored since the area is relatively flat and as Dr. Tedrow ('52), has pointed out, the soils are very sandy. Surface runoff is negligible in the region.

Other aspects of soil relations may be worthy of further study, however. Dr. Chapman ('52) has just pointed out that, at present, we have no evidence to indicate that fire reduces soil fertility in the southern pine type. In the New Jersey pine region, a brief study of soil changes following controlled burning is to be published soon by the Yale Forestry School (Burns 1949). Apparently no serious change was observed following 15 years of controlled burning. The importance of the soil to any region is so great, however, that we should maintain studies on some of the managed areas over long periods, perhaps using the lysimeter or some similar technique.

Other aspects of the silvicultural plan which should be explored are its effects on wild life and on recreation values in the area. It has long been known that large uniform areas of vegetation are less productive of certain types of game than smaller tracts of variable vegetation structure. This is because of the operation of the so-called border effects. As Moore ('39) has pointed out, the breaking up of present large unmanaged areas of the pine region into units capable of management should produce more of these types of game. The mosaic of vegetation resulting from small tracts in various stages of the management program should also operate in this way.

The deer population is an important resource of the pine region. Deer hunting is quite extensive because of the proximity of the area to high population centers in New York, New Jersey, and Pennsylvania. The annual return from hunting licenses and other sales connected with hunting, together with the recreational values attached to this sport, should be considered in any management plan.

It would appear that the increase in pine seedlings and herbaceous cover and the production of more succulent shrub stems following controlled burning would result in increased deer browse. A careful evaluation of the entire management plan should be made by wild life specialists, however.

Finally, a plea should be entered that a large tract or two be set aside now as a natural area, and that it be exempted from any sort of management other than perimeter fire protection measures. Such areas of undisturbed vegetation and wild life are of immense value for observation and study purposes. From such areas may come the answers to some of tomorrow's problems.

It is obvious that the broader ecological relationships of controlled burning need further study. As the practice gradually gains wider usage the importance of getting these studies underway becomes more urgent. It is to be hoped that the present spirit of cooperation in getting such studies started that seems to prevail among the various groups interested in the area will continue, and that any serious breach of wise land use practices be prevented.

Literature Cited

Barksdale, H. C. 1952. Ground water in the New Jersey Pine Barrens. Bartonia 26: 36.

Beall, H. W. 1934. The penetration of rainfall through hardwood and softwood forest canopy. Ecol. 15: 412-415.

Buell, M. F. and J. E. Cantlon. 1952. Prescribed burning effects on ground cover in the New Jersey Pine Region. (In press.)

Burns, Paul Y. 1949. Effect of fire on forest soils in the Pine Region of New Jersey. Doctoral dissertation on file in the Sterling Memorial Library, Yale University. 143 pp.

Chapman, H. H. 1952. The place of fire in the ecology of pines. Bartonia 26: 39.

Demaree, J. B. and M. S. Wilcox. 1947. Fungi pathogenic to blueberries in the eastern United States. Phytopath. 37: 487-506.

Hoppe, E. 1896. Regenmessung unter Baumkronen. Mitt. forstl. Versuchsw. Österr. 21: 1-75.

Horton, R. E. 1919. Rainfall interception. Monthly Weather Rev. 47: 603-623.

Kittridge, J. 1948. Forest influences. McGraw Hill Book Co., Inc., N. Y.

Little, S. 1952. Silvicultural objectives and methods on upland sites in the New Jersey Pine Region. Bartonia 26: 34.

Markin, F. L. 1943. Blueberry diseases in Maine. Maine Agr. Exp. Sta. Bull. 419.

Mitchell, J. A. 1930. Interception of rainfall by the forest. Jour. For. 28: 101-102.

Moore, E. B. 1939. Forest management in New Jersey. N. J. Dept. Conserv. and Devel., Trenton, N. J.

Pearse, A. S. 1943. Effects of burning-over and raking-off litter on certain soil animals in the Duke Forest. Am. Midl. Nat. 29: 406-424.

Tedrow, J. C. F. 1952. Soil conditions in the pine barrens of New Jersey. Bartonia 26: 28.

Tomlinson, W. E., Jr., P. E. Marucci and C. A. Doehlert. 1950. Leafhopper transmission of blueberry stunt disease. Jour. Econ. Ent. 43: 658-662.

Wood, O. M. 1937. The interception of precipitation in an oak-pine forest. Ecol. 18: 251-254.

Future of the Pine Barrens

CARL B. CRANMER

Department of Conservation and Economic Development

" West of the marshland which girds the seashore lies an immense sandy plane scarce broken by any inequality and originally covered by a dense pine and scrub oak forest, a great portion of which has been once and some of it twice cut over. There are many square miles on which there is not a single human inhabitant and where the deer, foxes and rabbits are abundant and where the wolf and bear find a lair to protect their race from extirpation. But in many places the forest is awakened by the sound of the woodman's axe and the louder din of the forge hammer, and the forest glares with the light of the furnace or glass house. In this sandy desert are many veins of generous soil which yield a compensatory crop of corn and rye to the labors of the husbandman."

Thus Gordon described the Pine Barrens in his Gazetteer of New Jersey printed in 1834.

Turn back the pages of history nearly one hundred years and see a portion of this vast area as Surveyor John Lawrence recorded it in his " Field Notes and Journal " when he surveyed the East-West Jersey line in the fall of 1743. Beginning at a point about two miles southwestward of Beach Haven he ran a line to a point on the Delaware River near Devans, Sussex County, marking a tree at the end of each mile.

The following have been obtained from his journal. At the end of the 6th mile he records a 4″ pine sapling on brushy upland; and 9 miles, a 3″ pine bush on poor pine land; at 11 miles, a 14″ pine and he notes " The last 2 or 3 miles run through small scruby oak bushes, their tops bent to the ground with acorns "; at 17 miles, a 5″ pine sapling on the east side of a cripple swamp in the line. The last mile scrub oaks about 6 or 7 foot high, standing very thick; at 18 miles, a 4″ pine sapling in a great plain (with respect to trees) but full of low scrubby oaks; at 21 miles, an 8″ dead pine on a high hill. The trees and shrubs all killed with fire.

After crossing two small branches of the "Ancocus " at the end of the 26th mile he records a 9″ black oak sapling on a ridge of good pine land. (This is about a mile west of Whitings); at 27 miles a 4″ black oak sapling. Tolerable good pine land.

In all he recorded 29 trees in what we consider the Pine Barrens. Of these, 26 were living pines with an average diameter of 6.6 inches. One 8 inch fire killed pine, and two oaks. Only where oaks were recorded did he mention good pine or tolerably good pine land.

His line roughly follows the drainage divide of this area. There are few natural fire breaks. As a result forest fires have been larger and much more frequent than in other sections of the Pine Barrens.

Economic History of the Pine Barrens

" The Pines " is an old country industrially. As early as 1684, iron was smelted from bog ore at Tinton Falls, in Monmouth County. While this forest region was never highly developed in a modern sense, it did support many thriving towns and industries, which, for the most part, have disappeared. The few towns which remain reveal but scant evidence of their former prosperity.

Many pursuits contributed to the former prosperity of this vast woodland area. Among the more important was the smelting of iron from bog ore which was abundant throughout the Pines. Thousands of bushels of charcoal, used as a domestic fuel and in smelting the iron were produced annually. Firewood was shipped from coast and river ports to supply industry, railroads, steamboats and for domestic use. In Cape May County, as many as 16 sloops piled high with wood, left Dennisville on a single tide. Lumber was cut by many small sawmills, scattered over this wilderness, from the stands of pine, oak and the choice growth of white cedar.

There were other industries of varying degrees of importance. Glass factories were established here and there; paper mills were built at several places; silk and cotton mills sprang up in various localities; shipbuilding was an industry of importance; salt works where sea water was evaporated and the brine recovered were common; and naval stores were produced in a limited way.

The collapse of industry in the Pine Barrens occurred about 1860 and was due chiefly to three things: the discovery of anthracite coal, the development of richer iron deposits elsewhere in the United Stats, and the virtual exhaustion of the timber supply.

Other factors contributed to the demise of industry; coastwise shipping decreased with the advent of the railroads; shipbuilding was curtailed and ceased altogether toward the close of the last century. Following the industrial decline, which was precipitous in the case of the iron industry, this region became depopulated with surprising rapidity.

This industrial decline coupled with the removal of nearly all of the merchantable timber from lands that are sub-marginal for agriculture and resulted in more than 400 land " schemes " similar to Paisley,—" The Magic City ". As a result of this so called " development " the land situation is appalling. The ownership of large acreages is unknown; while, on a huge acreage, the taxes have been unpaid for decades.

Forest fires have been the greatest single obstacle to the re-establishment of forests in the Pine Barrens. For years, little atttempt was made to extinguish them and they were allowed to burn until stopped by some natural barrier, such as a swamp, stream, road or perhaps a shift of wind. In the past 37 years New Jersey has seen some 48,000 fires burn 2,060,000 acres.

In 1930 the forest growth on over a quarter of a million acres, much of it in the Pine Barrens, was destroyed or severely damaged. A single fire accounted for over 43,000 acres. That was the blackest year in our forest fire history and many of the areas, not since damaged by severe fire, are beginning to make a recovery. However, in 1936 a fire of 46,000 acres, much of it reburn of the 1930 fire, killed 6 CCC boys. In 1941 there were 2,495 fires which burned 86,800 acres. Five of these accounted for 31,000 acres.

With this past fire history, is it any wonder that there is such strong evidence that age, origin and crown injuries by severe fires affect the growth of pines more than differences of soil and moisture; that over 33 per cent of the " pines " is tax delinquent; that the program for State Forests has been dormant for nearly 20 years, and that there are so few private individuals interested in owning timber lands in South Jersey?

The more favorable fire record since 1943 is attributed to more mechanized equipment, including fire trucks and tractor drawn plows, better radio communications, organization of the Forest Fire Service and favorable fire weather. The reduction in the number of fires may be due to wider publicity and education through radio, " Smokey Bear " posters and literature distributed to school children.

In a recent issue of N. J. Municipalities Magazine, the State Firewarden said: " The greatest contributor to the disaster of forest fires in New Jersey is the rapidity with which they spread due to the tinder-dry forest and the high shifting winds, which are the main factors causing periods of high fire frequency. Therefore, each and every fire that starts is a potential major fire unless it is brought under control within a few minutes after starting. In New Jersey, it is not an uncommon occurrence for as many as 75 fires to start during a single day and ten of these to be of major proportions. Thus, it can be seen that if the number of fires were doubled or tripled, the State Forest Fire Service would have an immense problem and damage would be undoubtedly very high."

For the past 100 years there have been few employment possibilities within the Pine Barrens. Cranberrying, picking wild huckleberries, gathering sphagnum and Christmas greens, spasmodic charcoaling and wood cutting, sawmilling and the manufacture of rustic furniture have constituted the major opportunities for employment in a sparsely settled region.

Blueberries: In 1932 there were 296 acres of blueberries in production. By 1950 this had increased to 2,800 acres, but there are indications that this will level off. Increased costs for labor, fertilizer, packaging materials and the need for expensive irrigation systems for frost and drought protection, " stunt " and other diseases, are limiting factors. Many of the operators of blueberry patches, at their own expense, are transporting pickers from more densely settled areas as far as 25 miles away.

Cranberries: In 1910, nearly a quarter of a million barrels of cranberries were produced from approximately 12,000 acres. In 1950, 98,000 barrels were produced from about 7800 acres. Nearly 4000 acres are recorded as being non-bearing (either neglected or abandoned). Some of this acreage has been converted to blueberries.

Public ownership in the Pine Barrens began in 1905 with the purchase of Forest Reservations. By 1923, there were 9,150 acres in State Forests. An acquisition program began in the late 1920's, with an estimated goal of 200,000 acres, increased the area in State forest to 41,200 acres in 1935. Since the early 1930's there has been no general acquisition policy in effect and as a result only 1,500 acres have been added to the State forests in the past 15 years. An average price of $5.38 per acre has been paid for all of the 58,437 acres now in State forests.

Under chapter 73, laws of 1940, municipalities could give tax distressed lands to the State for forest and park purposes. The donors, according to the law, were to receive 10 cents per acre per year tax lieu, as on other forest and park lands. From 1940 to 1944 over 5000 tax certificates covering a net total of 19,050 acres, duplication eliminated, were given to the State. No tax lieu has been paid. Because of the lack of policy, the Department has been unable to clear the title or consider the 19,000 acres as part of the State Forests and begin management practices to make this acreage more productive.

The Division of Fish and Game began the purchase of Public Shooting and Fishing Grounds in the middle '30's with funds from fishing and hunting licenses and the Federal Tax on arms and ammunition. There are now 45,000 acres of such lands in South Jersey, 28,000 acres of which have been acquired since 1940. The Division of Fish and Game has a goal of at least 100,000 acres.

There are now 643 people to the square mile in New Jersey. About 170,000 hunting and 120,000 fishing licenses are sold annually. The gunning pressure on open lands is terrific. Development of shooting and fishing grounds has been started to increase the game carrying capacity of these lands by the installation of impoundments for water fowl and food patches for upland game including quail, rabbits, deer and grouse. Pheasants are creatures of cultivated areas and are not adaptable to the Pine Barrens.

Game managers estimate that about 6% of the upland areas are needed for food patches to support the maximum amount of game. The balance to be kept in woods for range and cover.

The water resources of South Jersey have been almost untouched. Atlantic City owns a watershed near Absecon from which they obtain part of their water. Cranberry growers are the other principal water users in the Pine Barrens. Recreation on South Jersey State Forests centers around water at Lake Nummy on the Belleplain Forest, Lake Absegami on the Bass River Forest, Lake Oswego on the Penn Forest and Pakim Pond on the Lebanon Forest. The latter two are cranberry bog reservoirs on State lands and may set the pattern for similar multiple public and private use of water resources.

Lake Absegami attracts 100,000 people annually from as far away as Quebec, Canada for bathing, fishing, picnicking, camping and vacations in cabins. The local merchants in New Gretna estimate that 25% of their summer sales are made to these visitors. Enlargement of such publicly owned recreation areas can be an economic asset to the region.

The Pine Barrens shows little indication of the purpose for which most of it is best suited—the growing of timber crops. The lack of a stable market for a wide variety of small sized trees, heavy cutting of a single species, repeated severe forest fires, and lack of seedling reproduction has retarded the practice of forestry on both public and private lands.

Now the picture is brighter: In 1946 roofing-felt plants consumed about 63,000 cords of pulpwood, mostly from small sized trees. While nearly 75% of the pulpwood came from pine, one plant, by making minor changes in pulping processes, provided an annual market for nearly 15,000 cords of mixed hardwoods. This market has enabled Conservation agency foresters to assist South Jersey owners in more intensive management of their woodlands and help them to realize some cash return from the low quality material found in most woodlots.

During the three years that the program has been in effect, over 8,400 cords of pulpwood have been cut from about 800 acres in 140 ownerships. Under this program, a larger market for small sized hardwoods can result in greater forest production from the woodlands of South Jersey.

However, it is estimated that during the past year a total of about 155,000 cords of wood was cut from not less than 30,000 acres. Most of the cutting has been done in such a manner that it will be years before these areas can be returned to full production. Fifty years is a long time in the life of a man, but short in the life of a forest. With the prospect of no immediate cash return, much of the cut-over land can be expected to appear on future tax lists.

Prescribed burning for protection has been done on South Jersey State Forests for over 25 years. In earlier days this was restricted to narrow strips only 25 to 200 feet in width. The cost of burning these strips was high, oftentimes more expensive than burning the entire stand. The 1946 New Lisbon fire of over 1000 acres, which destroyed summer homes valued at $50,000, was stopped on a three-quarter mile front at the Lebanon Forest boundary on a prescribed burned area. This showed the advantage of " protection in depth " in stand burning. This past spring " protection in depth " meant stopping fire on the Bass River Forest; and reduced the killing damage of a fire at Manumuskin from over 60 per cent on untreated areas to less than 20 per cent on treated areas. It also reduced the kill on treated areas to trees of unmerchantable size.

" Protection in depth " has led to a general policy of using prescribed fire on State Forest lands. In 1951, seven per cent of all South Jersey Forests were burned. This winter's burning is planned for 8.2 per cent. The ultimate goal is about 10 per cent. This will have more significance in regenerating seedling pine as the present degenerate, fire damaged, oak-pine stands become older and are ready for harvest.

Prescribed burning on private lands began in 1948. Last year over 5,100 acres were burned. Plans for this winter call for the burning of 8,200 acres and read like a report of forest fires: Medford, Weymouth, Red Lion, Four Mile, Williamstown, Cassville, Marlton, Nesco, Speedwell, Sooy Place, Egg Harbor, Toms River, Pasadena, Indian Mills, Tabernacle and Atsion.

Willis M. Baker, former New Jersey Associate Forester, once said that if a way could be found to get South Jersey reforested with pine, and wild fires controlled, it would be the salvation of the Pine Barrens.

Dr. Chapman has shown why prescribed fire is needed to fit the ecology pattern of our native pines and Dr. Little how this can be applied to oak-pine upland sites.

Recent experience shows that prescribed burning makes wild fire easier to control, insures present stands from killing damage and provides a cheap means of reforestation. Ten or more pines for a penny can easily be obtained on many upland sites. Coupled with the market for mixed hardwoods, prescribed burning offers an opportunity to rehabilitate from one to two thousand acres of South Jersey woodlands each year. Yields of 17,500 board feet per acre in 60 years with a stumpage value of $300 per acre, now a rarity, may become commonplace.

The Pine Barrens area of 800,000 acres in 24 municipalities of Atlantic, Ocean and Burlington counties supported a fairly constant population of less than 20,000 people from 1880 to 1920. Beginning in 1920 there was a sharp rise in population when new highways were built in the area. Population in 1950 was 38,267, an increase of about 8000 during the past 10 years. This increased population has, for the most part, located around the fringe of the Barrens. The Naval Air Station at Lakehurst and the expansion of Fort Dix have provided additional employment and an increase in population in adjacent municipalities. Resort towns and the employment opportunities provided by them has increased the population of Egg Harbor Township considerably. Other increases have been noted along the major highways. Most of these people live in the pines but find employment elsewhere. Bass River Township with an 1880 population of 1,006 now has a population of 688. In 1940 its population was only 599.

Boom along the Delaware River: The building of a half billion dollar plant by U. S. Steel in Bucks County, Pennsylvania, just across the River from Trenton, has triggered a two billion dollar industrial expansion program from Burlington, southward to Penns Grove between the River and the N. J. Turnpike. Plans are now being prepared to dredge a 40 foot ship channel to Trenton. Home builders in South Jersey salute the new enterprises and estimate that between 24 and 28 thousand new homes will be built within the next year. On the east, at Toms River, a new pharmaceutical plant is building which is expected to employ several hundred people. The Southern New Jersey Development Council is fostering increased industrial, agricultural and recreational use in the South Jersey area.

This industrial expansion will be felt in the Pine Barrens, principally along major highways, where homes can be expected to be built. Looking at a map prepared by the Planning Section of the Department of Conservation and Economic Development it is easily seen that these communities are not prepared for a rapid expansion. No building codes, no real estate sub-division control, no zoning ordinances, no nothing. Any development in these areas will be like Topsy 'just growed.' An indication of this is already apparent along the White Horse Pike between Egg Harbor City and Absecon where one can buy a 40 x 100 foot lot for only $75.00. Here there are 4,100 acres of the Pine Barrens being divided into lots on which trailers and shacks are being erected. Are they creating another Paisley? I understand that no clear title goes with the purchase of the lots.

The Planning Section has prepared a Development Plan for New Jersey to give an over-all pattern for the future physical development of South Jersey including the Pine Barrens. Within the framework of this plan, orderly development can and should take place as needed.

Basic considerations for the plan find that more than two-fifths of the entire land area in the State has little agricultural value or can be made productive only at disproportionate cost; 33.4 per cent of the pine lands are chronically tax delinquent and this tax delinquency is further aggravated by a surplus of building lots accumulated through a series of real estate booms.

By reason of its low-quality and excessive quantity, much of this land will never be sold or occupied as building sites; much of it will be unable to meet future competition of new, better-located, and more modern sub-divisions, and many thousands of areas of the premature platted lands, unless replatted or reclaimed for other uses, will continue indefinitely as a costly liability to the municipalities in which they are located. Recommendations of the plan call for a broad land use policy to be adopted by the State. Indicated on the map are General Purpose proposals for land that has presented problems in three or more phases of the study: sub-marginal soil, low productivity, tax delinquency, or excess sub-division. This is land that is unable to pay its way and is a drain on the taxpayer.

It is intended that most of the proposed public land areas serve such public purposes as protection of present and future public water supplies, fish and game lands, timber growing and general recreation.

The problem of tax foreclosure was greatly simplified by the "In Rem" law of 1948 providing foreclosure proceedings against the property and not the owner. Greater use of this procedure by the municipalities should be encouraged. All such tax-land holdings should be carefully checked with the State Plan and municipal plans, in order to determine tracts that can be advantageously held in municipal ownership or transferred to the State. Appropriately employed, this can be a fertile means of achieving the goal for State owned General Purpose Areas.

The Plan proposes that the assembly of these lands be started as rapidly as economically feasible, that the Department of Conservation and Economic Development be designated as the receiving agency, given the means for acquiring and administering the land subject to transfer of portions of it to other State Agencies as needed for specified public purposes. The Department to be provided with an annual purchase fund of not less than $100,000 for the acquisition of general-purpose lands and that the condition of acceptance and disposal of lands thus acquired be as follows:

1. Land to be acquired by acceptance of tax-title liens from municipalities in accordance with Chapter 73, Laws of 1940 and Chapter 96, Laws of 1948; or through land purchases by the Federal Government under the Fulmer Act; or by gift; or by purchasing under favorable terms; or by such other means, legislative and otherwise, as may subsequently be made available to the Department.
2. All such lands, however to be acquired, to be scrutinized for conformity with the accompanying Plan and not to be taken or accepted if nonconforming unless shown to be essential for a special public purpose.
3. All lands conforming to the Plan to be taken or accepted whenever obtainable upon reasonable terms, irrespective of availability of funds for their immediate development or of their relation to other existing state holdings.
4. All lands thus acquired, not specifically designated or acquired for another specific use to be held under the stewardship of the Department of Conservation and Economic Development for such treatment and public use as may seem most appropriate such as forest land, recreational areas, etc.
5. Purchases of sub-marginal land for general public purposes to be directed first toward the piecing out of land areas otherwise acquired.
6. Purchase to exclude privately developed parcels of exceptional value unless needed for a special purpose or for the protection of other holdings.

There are two things that are needed to place this plan in operation:

1. A clear-cut State acquisition policy authorized by the legislative and executive branches of the State Government.
2. A general education program for municipal officials in applying the " In Rem " foreclosure proceedings. A Regional Planning Unit is needed in the Pine Barrens to assist the municipal officials in applying the " In Rem " proceedings to clear title to tax lands that have the best economic possibilities in private ownership. Other lands should be retained by the municipalities or transferred to the State for General-purpose lands.

Under this program of rational development our natural resources of fish and game, potable water, varied recreational opportunities and timber supplies may be preserved and the wilderness of the Pine Barrens can be given to future generations as a heritage of increased usefulness and enjoyment.

Program of Meetings during 1949

Date	*Subject*	*Speaker*	*Attendance*
Jan. 27	Impressions of Panama and Guatemala	John M. Fogg, Jr.	43
Feb. 24	Collecting in Mexico	Ruth Patrick	32
Mar. 24	Native Flowers and Some of Their Insect Visitors	Josephine de N. Henry	67
Apr. 28	A Botanical Cruise in the West Indies	George R. Proctor	23
May 26	The Preparation of a Flora of Pennsylvania	H. A. Wahl	28
Sept. 27	Dynamic Plant Geography of Pennsylvania	Edgar T. Wherry	48
Oct. 27	Botanizing in the Andes of Northern Peru	Francis W. Pennell	39
Nov. 17	Plants with Wet Feet	Philip Atlee Livingston	24
Dec. 15	A Spring Trip to the West	Edgar T. Wherry	37

Program of Meetings during 1950

Date	*Subject*	*Speaker*	*Attendance*
Jan. 26	Some Arctic Flowering Plants	Neal A. Weber	40
Feb. 23	The Exploration of Cerro Sipapo, Venezuela	Bassett Maguire	34
Mar. 23	Old Friends and New Acquaintances among Mexican Plants	Mrs. Ida K. Langman	21
Apr. 27	June-Flowering Plants from the Black Hills to the Olympics	Ralph M. Sargent	43
May 25	Adventures in Bog Trotting	Richard B. Chillas, Jr.	34
Sept. 28	Reports on the Seventh International Congress, Stockholm, 1950	Ruth Patrick Wendell H. Camp	36
Oct. 26	The Windward Islands of the Caribbean	Victor W. von Hagen	34
Nov. 16	Flowers of Southern New Jersey especially of the Pine Barrens	Ralph M. Sargent	42
Dec. 21	Camera Studies of Bog Plants	Edgar T. Wherry	30

Program of Meetings during 1951

Date	*Subject*	*Speaker*	*Attendance*
Jan. 25	Some Ferns of Australia and New Zealand	William W. Cadbury	31
Feb. 22	A Botanist's Summer on the Erie Islands	Robert B. Gordon	24
Mar. 22	Old and New Plants at Gladwyne	Mrs. J. Norman Henry	41
Apr. 26	Beyond the Poconos	W. L. Dix	27
May 24	A Botanical Trip to Finland	F. R. Fosberg	51
Sept. 27	Notes on the Wild Flowers of Australia	A. Keith Ashby	28
Oct. 25	Early Spring Flowers of the Carolina Coastal Plain	Ralph M. Sargent	40
	Dionaea and Other Carnivorous Plants	Theodore P. Haas	
Nov. 15	Botany among the Aztecs	Mrs. Ida K. Langman	24
Dec. 27	Characteristic Plants of the Philadelphia Region	Edgar T. Wherry	64

List of Officers and Members, 1949-1950-1951

Francis W. Pennell, *President*
Mrs. J. Norman Henry, *Vice-President*
Walter M. Benner, *Secretary*
Harry W. Trudell, *Treasurer*
Bayard Long, *Curator*
Francis W. Pennell, *Editor of* BARTONIA

ACTIVE MEMBERS

(as of October 1, 1952)

	Elected
J. W. Adams, 32 Pleasant St., Philadelphia 19, Pa.	1925
Walter Ainsworth, 426 Cross St., Ann Arbor, Mich.	1946
Mrs. A. C. Barnes, Latch's Lane, Merion, Pa.	1942
Edwin B. Bartram, Bushkill, Pa.	1906
J. Russell Bebler, 6245 Wissahickon Ave., Philadelphia 44, Pa.	1919
Dr. Walter M. Benner, 5636 Loretta Ave., Philadelphia 24, Pa.	1912
Jasper T. Bentley, 201 W. Chestnut Hill Ave., Philadelphia 18, Pa.	1933
Dr. David Berkheimer, 518 Elm St., Reading, Pa.	1943
Mrs. William A. Black, 531 E. Livezey St., Philadelphia 28, Pa.	1950
Carl E. Bliss, 2106 Overbrook Road, Lakewood, Ohio	1924
John Bright, 511 Cheltena Ave., Jenkintown, Pa.	1943
Miss Ethel Brubaker, Beach Dale, Bird in Hand, Pa.	1939
William C. Brumbach, Esterly, Pa.	1943
Dr. William W. Cadbury, 274 W. Main St., Moorestown, N. J.	1950
Dr. W. H. Camp, Academy of Natural Sciences, Philadelphia 3, Pa.	1950
Richard B. Chillas, 233 Winona Ave., Philadelphia 44, Pa.	1942
Prof. M. A. Chrysler, Chaplin, Conn.	1931
John W. Coburn, 120 Nippon St., Philadelphia 19, Pa.	1951
F. Van Buren Connell, "Hollybrook", Brookside Ave., Wayne, Pa.	1924
W. L. Dix, 801 Crown St., Morrisville, Pa.	1942
Albert Donaghy, 7811 Chelwynde Ave., Philadelphia 42, Pa.	1952
Robert R. Dreisbach, 301 Helen St., Midland, Mich.	1922
Miss Elizabeth C. Earle, 4209 Chester Ave., Philadelphia 4, Pa.	1935
Howard W. Elkinton, 6514 Germantown Ave., Philadelphia 19, Pa.	1931
Mrs. Nellie Erisman, 1821 Mt. Vernon St., Philadelphia 30, Pa.	1945
Mrs. Harold Evans, "Awbury", E. Washington Lane, Philadelphia 38, Pa.	1931
Richard Blossom Farley, "Sarobia" Eddington, Pa.	1931
Carl W. Fenninger, 1632 Chestnut St., Philadelphia 3, Pa.	1947
Albert J. Ferkel, 1101 N. 63rd St., Philadelphia 31, Pa.	1948
Miss Elizabeth H. Flavell, 6146 Wayne Ave., Philadelphia 44, Pa.	1946
Dr. John M. Fogg, Jr., University of Pennsylvania, Philadelphia 4, Pa.	1921
Fairman R. Furness, Media, Pa.	1935
Miss Elizabeth A. Gest, R. D. 1, Telford, Pa.	1944

John Gill, 2 Linden Ave., Haddonfield, N. J.	1939
Dr. Thomas S. Githens, Cambridge Apartments, School Lane and Wissahickon Ave., Philadelphia 44, Pa.	1945
Dr. Robert B. Gordon, 415 Sharpless St., West Chester, Pa.	1942
Mr. & Mrs. Robert Greenwood, Gladwyne, Pa.	1952
Dr. Theodore P. Haas, Phila. College Pharmacy & Science, Phila. 4, Pa.	1946
Louis E. Hand, 8061 Fairview St., Philadelphia 36, Pa.	1936
Miss Ann Harbison, " The Barclay " 18th St. & Rittenhouse Square, Philadelphia 3, Pa.	1944
Mrs. J. Norman Henry, Gladwyne, Pa.	1932
Miss Josephine DeN. Henry, Gladwyne, Pa.	1938
Mr. & Mrs. A. H. Holcombe, Jr., 1330 Youngs Ford Road, Gladywne, Pa.	1949
Lee P. Hynes, 36 West End Ave., Haddonfield, N. J.	1939
Miss Nancy E. James, 4043 Baltimore Ave., Philadelphia 4, Pa.	1942
Prof. Marion A. Johnson, Dept. Botany, Rutgers University, New Brunswick N. J.	1946
John Kenealy, Gladwyne, Pa.	1952
Miss Natalie B. Kimber, 538 E. Locust Ave., Philadelphia 44, Pa.	1928
Rev. William U. Kistler, 118 Main St., Pennsburg, Pa.	1911
Ludwig A. Koehner, 1701 Race St., Philadelphia 3, Pa.	1952
Mrs. Ida K. Langman, 3509 Baring St., Philadelphia 4, Pa.	1937
Dr. Hui-Lin Li, Morris Arboretum, Philadelphia 18, Pa.	1944
Dr. Harry A. Lloyd, 200 N. 35th St., Philadelphia 4, Pa.	1931
Bayard Long, 250 Ashbourne Road, Elkins Park, Philadelphia 17, Pa.	1906
John R. McIntosh, 304 Winona Ave., Philadelphia 44, Pa.	1945
Dr. Edwin T. Moul, Dept. Botany, Rutgers University, New Brunswick, N. J.	1945
George F. Nicklas, 3410 Race St., Philadelphia 4, Pa.	1951
Frederick M. Oldach, 323 Wellesley Road, Philadelphia 19, Pa.	1951
Mrs. George B. Orr, Willowbrook Farm, Paoli, Pa.	1935
Miss Elizabeth G. Ostheimer, Jenkintown, Pa.	1933
Dr. Samuel C. Palmer, 26th & Chestnut Sts., Chester, Pa.	1929
Walter Palmer, Route 16, Media, Pa.	1952
Mrs. Frank Parker, 400 S. 45th St., Philadelphia 4, Pa.	1950
Dr. Ruth Patrick, Academy of Natural Sciences, Philadelphia 3, Pa.	1937
Harold W. Pretz, 123 S. 17th St., Allentown, Pa.	1909
Miss Helen Ramsay, 1328 Jerome St., Philadelphia 40, Pa.	1945
Miss Anne Rowland, Meadowbrook, Pa.	1948
Mrs. Karl Rugart, 612 Bryn Mawr Ave., Penn Valley, Narberth, Pa.	1942
Dr. Ralph M. Sargent, 4 College Circle, Haverford, Pa.	1948
Dr. Robert L. Schaeffer, Jr., 32 N. 8th St., Allentown, Pa.	1938
Dr. J. R. Schramm, Morris Arboretum, Philadelphia 18, Pa.	1937
Henry Skinner, Morris Arboretum, Philadelphia 18, Pa.	1942
Dr. & Mrs. Robert V. Speck, Apt. 117-B-Haddon Hills, Crystal Lake Ave., Haddonfield, N. J.	1947
Dr. C. I. Stiteler, 507 Welsh St., Chester, Pa.	1945
Hugh E. Stone, 431 Berkley Road, Haverford, Pa.	1892
Dr. Robert R. Tatnall, 236 Lancaster Ave., Wynnewood, Pa.	1928
Mrs. Howard W. Taylor, Gladwyne, Pa.	1952
Dr. George S. Tarnowski, 158 Crosswell Ave., Staten Id. 4, N. Y.	1950
Horace E. Thompson, 5016 Schuyler St., Philadelphia 44, Pa.	1920
William Thompson, Jr., Leroy Court Apts., #403, 1700 S. 60th St., Philadelphia 42, Pa.	1936
Henry Stanton Tillotson, 40 B Erma Court, Upper Darby, Pa.	1951
R. J. Titherington, 6317 N. Norwood St., Philadelphia 38, Pa.	1942

Harry W. Trudell, 1309 Highland Ave., Abington, Pa. 1915
Mrs. Elizabeth A. Valentine, 3943 Locust St., Philadelphia 4, Pa. 1949
Mrs. J. H. Vance, 307 Levering Mill Road, Bala-Cynwyd, Pa. 1950
Dr. Paul R. Wagner, Ursinus College, Collegeville, Pa. 1935
E. Perot Walker, 511 Lynmere Road, Bryn Mawr, Pa. 1939
Mrs. Marguerite L. Warnke, 142 S. Logan Ave., Audubon, N. J. 1935
Miss Hilda Weber, 1020 Earl St., Philadelphia 25, Pa. 1950
Miss Evelyn Wells, Biological Abstracts, University of Pennsylvania, Phila. 4, Pa. 1947
Robert F. Welsh, 325 Chestnut St., Philadelphia 6, Pa. 1909
Dr. Edgar T. Wherry, Dept. of Botany, University of Pennsylvania, Phila. 4, Pa. 1925
Hans Wilkens, 424 S. 15th St., Reading, Pa. 1928
Miss Elizabeth Wistar, 200 Montgomery Ave., Philadelphia 18, Pa. 1952
William H. Witte, Riegelsville, Pa., R. D. 1898
Howard Wood, Jr., "Aloha", R. D. 1, Conshohocken, Pa. 1944
Miss Mary F. Wright, 231 Winona Ave., Philadelphia 44, Pa. 1928

HONORARY MEMBER

Dr. Edward E. Wildman, 4331 Osage Ave., Philadelphia 4, Pa. 1931

CORRESPONDING MEMBERS

Dr. Elmer D. Merrill, Arnold Arboretum, Jamaica Plain 30, Mass. 1945
Dr. Harold St. John, University of Hawaii, Honolulu, T. H. 1927
Dr. William Randolph Taylor, University of Michigan, Ann Arbor, Mich. 1921
Dr. Campbell E. Waters, Chevy Chase, Washington, D. C. 1904
Dr. Heber W. Youngken, Massachusetts College of Pharmacy, Boston, Mass. 1918

MEMBERS RECENTLY DECEASED

Dr. Merritt L. Fernald .... September 22, 1950
Charles F. Jenkins .... July 2, 1951
Dr. Francis W. Pennell .... February 3, 1952
Morris E. Leeds .... February 8, 1952
Dr. Henry A. Laessle .... May 13, 1952

No. 27 ✓ 1952–53

BARTONIA

JOURNAL OF THE PHILADELPHIA BOTANICAL CLUB

CONTENTS

A Preliminary Study of the Genus Chenopodium in North America HERBERT A. WAHL 1

Spores, Sporangia and Indusia of the Genus Dryopteris in North America, North of Mexico .... CLYDE F. REED 47

Color Variations of Two Plants in the Southern Appalachians RALPH M. SARGENT 57

A Field Trip to the New Jersey Pine Barrens .... MARGARET G. BUTLER 59

Programs and list of members 62

R. 1.00

PUBLISHED BY THE CLUB
ACADEMY OF NATURAL SCIENCES, NINETEENTH AND THE PARKWAY
PHILADELPHIA
ISSUED DECEMBER 20, 1954

MISSOURI BOTANICAL
RECEIVED
FEB 10 1955

BARTONIA

Journal of the Philadelphia Botanical Club

Devoted primarily to the flora of the mid-eastern United States, especially of eastern Pennsylvania, New Jersey and Delaware.

Subscription Price, $1.00. Back numbers, $1.00 each.

EDGAR T. WHERRY, Editor

**Academy of Natural Sciences, Nineteenth and the Parkway,
Philadelphia 3, Pa.**

BARTONIA

JOURNAL OF THE
PHILADELPHIA BOTANICAL CLUB

No. 27 1952–53

A Preliminary Study of the Genus Chenopodium in North America[1]

Herbert A. Wahl
Pennsylvania State University

No group of plants of comparable size and wide distribution known to the writer has suffered the lack of understanding of the taxa involved as has the genus *Chenopodium,* especially those members of its Section *Chenopodia* that are closely related to *C. album* and *C. Berlandieri.* The reasons for this lie in (1) the ecological variability characteristic of weedy annuals, (2) the fact that important diagnostic characters are present in the seeds, which are of small size and often lacking from collected material, (3) the repetition of similar variations in habit and leaf shape in distinct species and (4) the lack of pubescence characters in most species.

The first comprehensive treatment of the North American species was that of Standley[2] (12), in 1916. Although this work provided considerable clarification through the recognition of a dozen native species, the distinctions were, in some cases, based rather largely on habit and leaf shape and to a lesser degree on fruit characters. This led, especially in the *album* and *Berlandieri* complexes, to the inclusion of some unrelated plants under the same name and to the lack of recognition of other taxa. The species delimitations laid down by Standley were followed, however, by Fernald (6) and by Gleason (9) in their recent regional floras.

Adequate clarification of the genus was first accomplished by Aellen[2] (2), and later, with special reference to North American taxa, by Aellen and Just[2] (4). These two treatments might have resulted in a relatively complete understanding of the genus had the characters separating the taxa been more clearly and accurately pointed out in the keys. That this was not done is indicated by the lack of acceptance of the results in the above-mentioned revisions of the northeastern flora. Fosberg (7), discussing the separation of species related to *C. Fremontii*, says the differences seem " scarcely enough to base species upon, *even in Chenopodium* " [italics mine]. This sums up the attitude expressed by many who have dealt with the genus.

---

[1] Authorized for publication on March 25, 1954, as paper No. 1869 in the Journal Series of the Pennsylvania Agricultural Experiment Station. and as Contribution No. 185 from the Department of Botany, Pennsylvania State University.

[2] Since these important works are cited so frequently in the following pages, they are referred to simply as Standley, Aellen, and Aellen and Just, without citation of number.

In his 1929 paper Aellen described two native eastern American species of *Chenopodium*, one from Missouri and one from Cape Cod. The former, *C. missouriense*, turns out to be common and strikingly uniform, apparently throughout eastern U. S. south of about latitude 41°, although its distribution is as yet incompletely known. The latter, *C. macrocalycium*, is frequent as a coastal plant from Nova Scotia to southern New Jersey. It is almost invariably filed in herbaria under *C. album* or its var. *lanceolatum* (*C. lanceolatum* Muhl.) though not closely related to either. Collections of it have never been associated with *C. Berlandieri*, but additional material from the southern limit of its range may show it grading into this species, since it is closely related thereto. *C. missouriense* has most often been identified with *C. album*, the two being similar, although separable in the herbarium on the basis of seed size and other characters, and from a moving car at any time of the year; an ecological form of it is, however, the basis for part of *C. Berlandieri* of most American authors.

With these points in mind it seems that the expression " even in *Chenopodium* " may be inapropos. Perhaps " even in " is inapropos in all cases (including *Rubus*?), for in most critical and " troublesome " genera that have been subjected to really adequate study, differences of opinion are chiefly systematic. That is, they revolve around the question of whether a particular and generally recognizable entity should be considered as a species, to belong in some sub-specific category, or as not meriting nomenclatorial status at all. Confusing variations are especially frequent in weedy annual plants, of which *Chenopodium* is an outstanding example. They may best be resolved by field experience and various approaches of Experimental Taxonomy, although only after some understanding of the taxa involved has been attained. This stage of the taxonomic discipline seems to be late in arriving in several sections of the genus *Chenopodium*.

The work reported here started as an attempt merely to clarify those taxa especially closely related to the *C. album* series, incident to studies on the Flora of Pennsylvania. It has progressed, perforce, to a consideration of nearly all the North American taxa, but has stopped, temporarily and because of the press of other commitments, short of completeness and of monographic proportions. The hope is that reasonably adequate clarification of the species occurring east of the Mississippi River has been achieved. Some material of strictly western species has been studied (mostly found in herbaria under *C. album*) but the treatment of these is not presumed to be definitive. No doubt a large amount of material of western species is in western herbaria, and it is hoped that this may be included in a further study. Final elucidation of the more closely related taxa probably will be achieved, however, only by a combination of herbarium, field, and perhaps experimental work.

Material has been studied from the collections in the herbaria of the New York Botanical Garden (NY.), University of Illinois (Ill.), University of Pennsylvania (Penn.), Academy of Natural Sciences of Philadelphia (PH.), U. S. National Museum (US.), Department of Agriculture, Ottawa, Canada (OTB.), Pennsylvania State University (PAC.), Gray Herbarium (GH.) and the Herbarium of the New England Botanical Club (NEBC.). The author is indebted to the curators and personnel of these herbaria for the use of this material and for additional services.

CHARACTERS IN CHENOPODIUM

FRUIT

Examination of any significant amount of material offers convincing evidence that characters exhibited by the fruits (commonly referred to as utricles, although hardly ever with an inflated pericarp) are of primary significance in separating " interbreeding populations ". This is evident because of the relative distinctness between the fruits of individual species and because other characters are correlated with these fruit differences, not to mention the general acceptance of reproductive characters as of inherently greater diagnostic value than vegetative ones. Unfortunately the fruits are small, generally 0.5 to 2.0 mm. in diameter, and recognition of the characters, while they can usually be detected with a 10× hand lens, is often better obtained at a magnification of 15–20 diameters. Since the thickness of the pericarp is negligible in comparison to the width of the seed, measurements for seed and fruit may be used interchangeably.

While size, shape, and acuteness of the margins are valuable characters, those having to do with the attachment of the pericarp to the seed and with the surface markings of the pericarp (also present, though less apparent, on the seed) are diagnostic. In this paper, the pericarp is referred to as being attached to the seed if it does not rub off when the fruit is rolled between the thumb and fore-finger or when, on being scratched with the point of a dissecting needle, it separates only along the line of contact with this. It is considered separable when it comes off partially or entirely on rubbing (Fig. 1) or when it can be readily removed in flakes by a needle.

The surface of the fruit may be either smooth, reticulate, or variously roughened. In those described as being smooth, the surface of the nearly mature fruit, when sufficiently magnified, generally appears to be pebbled with tiny pustules. These may soon become detached leaving minute depressions, or they may remain as obscure roughenings, hardly visible at 10×. When completely mature these fruits become essentially smooth.

The reticulate condition consists of the presence of depressions (alveolae), usually roughly rectangular and elongate in a vertical direction on the fruit, and separated by continuous ridges (Figs. 8, 9, 15). This characteristic alveolate reticulation may often be seen even on young fruit but becomes more pronounced with age and is visible on the pericarps of mature fruits at a magnification of 10 diameters. Markings of an irregular nature, more or less intermediate between smooth and reticulate, may be present in some species, particularly in *C. urbicum* and *C. murale*.

A character which, to the writer's knowledge, has not been used heretofore, but which is useful in separating certain species, is the presence or absence of a style base. In *C. album,* for example, the style is divided to the base while in *C. Berlandieri* a minute stylopodium, hardly more than 0.1 mm. long but definitely recognizable, remains on the fruit. This is one of the few useful characters which may be observed on young fruit. The length of the style branches is often diagnostic for sections but relatively constant for related species.

The shape of the fruit, whether flattened dorso-ventrally (horizontal) or laterally (vertical) has long been recognized as a character of fundamental importance in the genus.

FLOWERS

Few features of diagnostic significance can be recognized in the flowers of this genus. That of the style base has been mentioned. A most useful character is found in the extent to which the midribs of the sepals are winged or keeled. While this character presents some variation within a species it is expressed in such extremes as to be of considerable diagnostic value. The extremes range from a complete lack of a keel (*C. urbicum* and others) to a wing which is as wide as the width of the sepal from the midrib to the lateral margin (*C. Berlandieri*) (Fig. 9). The last species can usually be separated from *C. album* by its extremely broadly winged sepals.

The extent to which the perianth parts (generally referred to as sepals) cover the fruit is diagnostic in certain cases. The width of the sepals varies to the extent that they may meet or overlap laterally, or they may be separated from each other by as much as their width.

Sequence of flowering, not ordinarily considered, is of importance in some cases. Since the inflorescences are basically cymose the central flowers are oldest and, in the very contracted cymes usually present (cymules, glomerules, heads), they occupy a terminal position. In these inflorescences the flowers and fruit may mature either uniformly or more or less prominently *mixed*. They are described as mixed when mature fruit is present before all perfect flowers in the same inflorescence have reached anthesis. In many cases later pistillate flowers are present and these may mature after all others.

As regards all the flowers or inflorescences on the same plant, they may mature almost *simultaneously* throughout or, more frequently, *successively* from top to base of the plant. In only one species seen, *C. foliosum*, is progression of flowering from the base to the tip of the plant, and here it is more markedly so than in any case of the reverse sequence.

LEAVES

In the earlier works (especially for taxa similar to *C. album*) leaf shape has been used to a considerable extent in separating species. While various species are indeed recognizable on this basis, the same leaf shape may occur in taxa which, according to flower and fruit characters, clearly represent different species. Wherever possible in the present work, however, leaf shape has been used in separating larger groups in the key, since it is the most obvious character and the one which is most often present. Mature seeds constitute the most important feature for recognition of species, but they may be lacking from herbarium material. Unfortunately, good primary leaves and mature fruits, the two most important diagnostic features, are rarely both present at the same time. Leaf texture is of fundamental importance but its well recognized ecological variability necessitates caution in interpretation.

PHOTOPERIODISM

Fuller (8) described the effect of photoperiod on *C. Quinoa* Willd. and summarized the previous literature. This phenomenon has apparently not been applied in connection with species delimitation in the genus. While the time of flowering may be more or less dependent on day length in various species, those which exhibit the most marked response in this respect are *C. Bushianum*, *C. missouriense* and, presumably, *C. giganteum*. The first of these flowers during the last week in August and the second during the second week in September, and this is independent of the age of the plant. Although no exhaustive attempt has been made to determine the exact length of the photoperiod which induces flowering, plants of *C. missouriense* grown from seeds sown in the greenhouse during the short fall and winter days have consistently flowered from the second or third node above the cotyledons and have never become more than a few inches high. Seeds sown in March and April produced plants which reached the roof of the greenhouse, had to be supported on stakes, and flowered on schedule the second week of September.

Under similar conditions *C. album* shows a preference for earlier flowering with shorter photoperiods but it may be found in flower any time from June until October. Examination of herbarium material has not disclosed a narrow photoperiod for other species but field observations may bring some cases to light.

KEY TO THE SECTIONS OF CHENOPODIUM

1. Plants variously both pubescent and glandular (inconspicuously vesiculose-pubescent in *C. aristatum* with diffuse dichotomous cymes and nearly linear and entire leaves).
   2. Perianth parts prominently veiny, united except the minute tips, entirely enclosing the utricle .... Sec. *Roubieva,* p. 6
   2. Perianth parts separate or fused only at the base.
      3. Seeds vertical, 0.5–0.7 mm. broad; flowers in small glomerules in the axils of the lobed leaves .... Sec. *Orthosporum,* p. 7
      3. Seeds chiefly horizontal, 0.7–1.0 mm. broad.
         4. Flowers in dichotomous cymes; leaves chiefly less than 3 cm. long; perianth and lower surface of leaves glandular or else these glabrous and young branches inconspicuously whitish vesiculose-pubescent .... Sec. *Botryoides,* p. 7
         4. Flowers in small glomerules or short spikes, these chiefly bracteate in an extensive paniculate inflorescence; well developed leaves generally more than 6 cm. long; lower leaf surfaces glandular but perianth parts less conspicuously so, usually glabrous .... Sec. *Ambrina,* p. 8
1. Plants glabrous or farinose but not glandular or pubescent.
   5. Seeds vertical or both vertical and horizontal in the same inflorescence (early stages of *C. glaucum* and var. may appear to have all horizontal seeds); plants glabrous or farinose but if conspicuously farinose on lower leaf surfaces then farinules inconspicuous or lacking on perianth parts; perianth 3-, 4- or 5-parted.
      6. Perianth parts chiefly 4 or 5, their margins erose-dentate; stigmas sessile, stout, tapering, conspicuous in flower and fruit, at least some of them becoming 0.8–1.2 mm. long; flowers in close or loose glomerules or cymes, these or at least the terminal ones forming a conspicuous stout ebracteate spicate inflorescence; plants perennial, sparingly farinose .... Sec. *Agathophyton,* p. 8
      6. Perianth chiefly 3-parted (4–5-parted in horizontal flowers which are terminal in the glomerules), the divisions entire or apiculate; stigmas not over 0.5 mm. in length; plants annual.
         7. Flowers in discrete dense globose heads in the leaf axils or forming terminal bracteate or ebracteate spikes; perianth parts in the upper heads sometimes red and becoming deliquescent in age; plants not farinose; seeds all vertical, maturing uniformly in the glomerules .... Sec. *Eublitum,* p. 8
         7. Flowers in glomerules, these either separate or forming contracted spikes in the axils of leaves or bracts or in small or large panicles; perianth parts membranaceous to coriaceous when young but becoming membranaceous in age, not deliquescent; terminal flowers of the glomerules (sometimes not apparent in later stages) with horizontal seeds, the lateral with vertical seeds, maturing successively from the former to the latter.
            8. Perianth parts of flowers with vertical seeds 3–4, united nearly to the tip; stigmas chiefly 0.2–0.3 mm. long, usually ascending in a V ... Sec. *Degenia,* p. 9
            8. Perianth parts (usually 3) of flowers with vertical seeds free nearly to the base or some but not all in each flower united above the middle; stigmas hardly exceeding 0.1 mm., horizontally spreading .... Sec. *Pseudoblitum,* p. 11
   5. Seeds horizontal, rarely and exceptionally a few vertical; plants variously farinose, usually prominently so and at least as much so on perianth parts as on leaves; perianth 5-parted .... Sec. *Chenopodia,* p. 14

Section ROUBIEVA Rouy

1. *C. multifidum* L. (*Roubieva multifida* (L.) Moq.)

The veiny pericarp covering the fruit is distinctive. South American; adventive on the east and west coasts of N. A.

Section ORTHOSPORUM R. Br.

2. *C. pumilio* R. Br. (*C. carinatum* Auth.)

Sparingly adventive from Australia. Easily recognized by the small vertical seeds. Leaves lobed, the proximal margin of the lobe tapering, the distal margin at a right angle to the blade. Plants pubescent and glandular throughout.

Section BOTRYOIDES C. A. Meyer

This section is characterized especially by the conspicuously dichotomously cymose nature of the inflorescence. The plants are relatively small with small leaves, flowers and seeds.

1. Glands on perianth parts chiefly stalked; stems densely glandular and pubescent; perianth parts acute to attenuate, not keeled or tuberculate; cymes contracted, in usually dense racemes .... 3. *C. Botrys*
1. Glands on perianth parts chiefly sessile or lacking; stems moderately to sparingly pubescent or glandular; perianth parts acute or obtuse, keeled or tuberculate; cymes diffuse, in racemes or panicles.
    2. Keel of perianth parts prominent, with several usually pointed tubercles toward the tip; cymes in loose racemes .... 4. *C. foetidum*
    2. Keel inconspicuous or lacking, the rib usually with a single sub-terminal tubercle; cymes scattered or paniculate.
        3. Perianth parts and lower surface of leaves glandular; leaves lobed .. 5. *C. graveolens*
        3. Plants glabrous or stems inconspicuously whitish vesiculose—or clavate—pubescent; leaves entire or nearly so .... 6. *C. aristatum*

3. *C. Botrys* L.

Widely distributed and generally recognized. The perianth parts are keel-less and densely covered with stalked glands. The plants occur especially on cinder dumps and railroad beds but also in gardens, on shores, etc.

4. *C. foetidum* Schrad.

Similar to *C. Botrys* in appearance but the cymes more diffuse and perianth strongly tuberculate-keeled and with the glands fewer and sessile. Probably essentially lacking in North America but two collections of plants grown from seed (as *C. Botrys*) at Dominion Arboretum and Botanic Garden at Ottawa, Canada, are in the Herbarium of the Department of Agriculture at Ottawa. No other records are known.

5. *C. graveolens* Willd. (*C. incisum* Poir.; *C. cornutum* (Torr.) Benth. & Hook.)

Several varieties in Central and South America. *C. graveolens* var. *neomexicanum* Aellen occurs in Arizona and New Mexico and this is the only material seen; it is also reported from Texas, Colorado, Maine, and Massachusetts. The plants are usually much branched with very numerous diffuse cymes and the perianth parts well supplied with orange-yellow sessile glands and each bearing a single prominent subterminal tubercle.

6. *C. aristatum* L.

Asiatic. Standley says " Reported from Alaska and Mexico " but known to the present author in the U. S. by a collection from Yonkers, New York: " about the Yonkers Cotton Mill ", Bicknell, July 1, 1894 (NY.). The single specimen is an immature plant and although very distinct in appearance has passed as " a form of *C. lanceolatum* ". The nearly linear, entire leaves are in striking contrast to the lobed leaves of other members of the section.

Section AMBRINA (Spach) Hook. f.

7. *C. ambrosioides* L.

The variations of this complex species have not been studied and will be reserved for a future article.

Section AGATHOPHYTON (Moq.) Hook. f.

Members of the section are readily recognized by the erose sepals, long-tapering stigmas, flowers in dense cymes or glomerules forming a terminal often caudate inflorescence and duration perennial.

Leaf margins entire except for the often hastate base; flowers in glomerules; perianth parts united less than half their length .... 8. *C. Bonus-Henricus*

Leaf margins prominently sinuate-dentate; flowers in cymes; perianth parts united half their length or more .... 9. *C. californicum*

8. *C. Bonus-Henricus* L.

Widely distributed but local in eastern U. S. and southeastern Canada (Nova Scotia, New Brunswick, Quebec, Ontario). Adventive from Europe.

9. *C. californicum* S. Wats.

Known only from central and southern California; apparently native.

Section EUBLITUM (Moq.) Aellen

Characterized by the dense globose heads of flowers in terminal spikes and by the perianth parts becoming red and deliquescent in age. In the material seen the latter character has been noted only in *C. capitatum* although it probably occurs also in older plants of the other two species. The plants are similar in appearance to those of Sec. *Agathophyton*, from which they are readily distinguished by the entire sepals and shorter stigmas.

Terminal heads ebracteate; flowers maturing uniformly or from top of plant downward; sides of fruit convex.

- Leaves truncate to cordate-hastate at base, the margins usually strongly toothed; principal glomerules on well-developed plants usually 6–10 mm. in diameter; stigmas chiefly 0.3–0.4 mm. long, flexuous .... 10. *C. capitatum*
- Leaves tapering or truncate-hastate at base, the margins somewhat toothed or entire; glomerules usually less than 6 mm. in diameter; stigmas chiefly 0.1–0.2 mm. long, squarrose .... 11. *C. Overi*

Heads prominently bracteate throughout; flowers maturing from base of the plant upward; sides of mature fruit more or less prominently flattened; leaves finely and sharply sinuate-dentate .... 12. *C. foliosum*

10. *C. capitatum* (L.) Aschers. (*Blitum capitatum* L.)

Widely distributed but local. More common northward. In Canada it occurs in Nova Scotia (rare), Quebec, Ontario (n. to Fort Albany on James Bay) and apparently more frequently through Manitoba, Saskatchewan, Alberta and British Columbia; also in Alaska. In U. S. chiefly scattered in the northern states. A single plant from British Columbia, Tranquille, Dewdrop Spring, Bring 502, June 1936, is worthy of note because in this very good collection the pericarp is uniformly and markedly separable from the seed, while in all other plants seen in fruit in this species and section the pericarp is strongly adherent. Various observations, of which this is an example, during the course of this study indicate the need for critical analysis of material from the general region around Oregon.

11. *C. Overi* Aellen (*Blitum hastatum* Rydb.)

The specific epithet *hastatum* is preëmpted in *Chenopodium*. Aellen and Just, following Standley, give the range of this taxon as " Wyoming to Oregon, Nevada and New Mexico ", and it is apparently native in the region as is *C. californicum* of the preceding section. It is not mentioned by Peck, " Manual of the Higher Plants of Oregon ", though it is at least in part the basis for *C. humile* in that generally excellent work, or by Abrams, " Flora of the Pacific States ". The following collections have been seen:

OREGON. Baker Co.: 8 mi. n.e. of Sumpter. Peck 10388, July 1921 (NY.). Wallowa Co.: Lostine Canyon, 18 mi. above Lostine. Peck 17830, July 1933 (NY.). Buckhorn Springs. Peck 18312, June 1934 (NY.). MONTANA. Flathead Co.: South fork of Flathead River, 7 mi. e. of Columbia Falls. Rogers and Rogers 1050, July 1942 (NY.). WYOMING. Yellowstone Lake. Nelson and Nelson 6613 (Ill.). NEVADA. Clark Co.: Charleston Mts. Train 2107, July 1938 (OTB.). NEW MEXICO. Bro. Arsene 21741 (US.).

The Oregon sheets were all distributed as *C. humile* and the Nevada sheet as *C. capitatum*. It is not certain from the material seen that this taxon is specifically separable from *C. capitatum*.

12. *C. foliosum* (Moench.) Aschers. (*Blitum virgatum* L.)

The specific epithet *virgatum* also preëmpted in *Chenopodium*. Differing from other members of the section in the bracteate infloresence and prominently sharply lobed leaves and from these and other members of the genus in the marked acropetal sequence of flowering and fruiting.

In addition to the single record cited from Alberta, Can., by Aellen, the following American collections have been seen:

NEW YORK. Yonkers: About the Yonkers Wool Mill. Bicknell, May 19, 1895 (NY.) (as *C. rubrum*). SOUTH DAKOTA. Lawrence Co.: Spearfish. In flower garden. Bennett 115, June 1947 (OTB.).

Section DEGENIA Aellen

Characterized especially by the vertical lateral flowers with 3 sepals united nearly to the tips. Members of the section are known in North America almost entirely from saline habitats in western coastal states and seem to be incompletely understood as to the relationships of the taxa involved.

Leaves densely to sparingly farinose or glabrate beneath, chiefly deltoid to deltoid-ovate, variously dentate; free tips of sepals rounded to acute.

Leaves densely farinose beneath; plants robust, freely branching.
13a. *C. macrospermum* var. *halophilum*

Leaves sparingly farinose and glabrate beneath; plants smaller, to 3 dm. high, branching or strict .... 13b. *C. macrospermum* f. *subviride*

Leaves glabrous or promptly glabrate beneath, deltoid, rhombic or spatulate, shallowly dentate to entire; free tips of sepals minutely but definitely apiculate.

Plants prostrate or low-branching; leaves often entire.
14a. *C. chenopodioides* var. *Degenianum*

Plants upright; leaves usually shallowly dentate.
14b. *C. chenopodioides* var. *Lengyelianum*

13. *C. macrospermum* Hook. f. occurs in a series of forms in South America. Aellen and Just characterize ssp. *crassicaule* as a thick-leaved, prostrate form with axillary glomerules and " Seed large, 1.25–1.5 mm." occurring in the Falkland Islands and Tierra del Fuego, and ssp. *halophilum* as an upright form with glomerules in terminal panicles and " Seed 0.75–1 mm. in diam." It is not certain that seed width is meant in both cases but in the small amount of South American material seen the smaller seed size occurs more often on semi-prostrate plants with glomerules in axillary spikelets, rather than in the upright plants as stated. (Hicken 401, Argentina. Legrand 1466, Uruguay. Herter 1187, Uruguay.)

Forms occurring in the U. S. agree with ssp. *halophilum* in their generally upright stature and glomerules in terminal panicles, but have the larger seed size given for var. *crassicaule*. The American plants were originally included under *C. murale*, which they resemble in leaf shape, by Watson (14, p. 97) and were separated specifically by Standley as *C. farinosum* (S. Wats.) Standley. Abrams (1, p. 71) doubts that the plants are conspecific with *C. macrospermum* from the Falkland Islands but examination of even a small amount of South American material indicates they are. Standley (13) reduced the various formae listed by Aellen to synonymy under *C. macrospermum* var. *halophilum* and this name is here used for the previously reported North American plants with a series of collections from California and one station on ballast at Wilmington, North Carolina. The North Carolina plant is upright but has axillary glomerules and is in marked contrast in this respect with the California plants seen, these having the glomerules in terminal panicles. Both have the lower leaf surfaces densely and permanently whitish-farinose, the margins prominently undulate-serrate.

Also along and near the Pacific coast in California but extending northward to Vancouver Island, British Columbia, Canada, there are plants differing from the above in having leaves with lower surfaces glabrous or glabrate, and with entire to shallowly undulate or toothed margins. These correspond to *C. macrospermum* var. *halophilum* f. *subviride* Thellung and Aellen and this category is temporarily retained for them although it is thought that additional material and further study will show them to be worthy of varietal status. The following collections of f. *subviride* have been seen:

British Columbia. Vancouver Island: Sidney. Macoun 86313, July 1908 (NY.). Washington. Snohomish Co.: Marysville, on Puget Sound. Grant, Aug. 1929 (Ill.). Whatcom Co.: Lumi Island, on Puget Sound. Muenscher 10499, July 1939 (NY., PH.). California. San Mateo Co.: Salada Beach. Wiggins 178, Nov. 1930 (NY.). Riverside Co.: Elsinore, margin of lake. Dec. 1891 (NY.).

They have been distributed as *C. rubrum, C. rubrum* var. *humile* and *C. hybridum*. Most of the distributed material is too young for ready identification.

14. *C. chenopodioides* (L.) Aellen (*C. crassifolium* Hornem.)

Plants of this species are most readily distinguishable from *C. macrospermum* by the relatively thinner sepals with definitely apiculate tips. Young stages of *C. chenopodioides* var. *Degenianum* (Aellen) Aellen are not easily separable from *C. macrospermum* var. *halophilum* f. *subviride* and, indeed, the present author has a feeling of uncertainty concerning some of the material assigned here. It seems desirable at the present time to maintain them as separate entities, at least as a course which would be most likely to stimulate further study of the group. In addition to those cited by Aellen the following records are assigned to var. *Degenianum*, the last three being range-extensions. All have been distributed and maintained as *C. rubrum* or var. *humile*.

Washington. Spokane Co.: Medical Lake. St. John, Bonser and Warren 6754, Sept. 1924. Alkali Lake, Amber. St. John, Mellen and Warren 4884, Sept. 1926. California. Borax Lake. Torrey 462, 1865. Nevada. Nye Co.: Meadow about thermal springs, Monitor Valley. Maguire and Holmgren 25768, July 1945. 1000 Spring Valley. Watson 978, Sept. 1865. Wyoming. Black Rock Creek. Tweedy 353, Aug. 1897. Colorado. Gunnison Watershed. Baker 935, 1901. New York. Yonkers Factory Grounds. Bicknell, June 3, 1894. (All NY.)

No material of *C. chenopodioides* var. *Lengyelianum* (Aellen) Aellen has been seen other than that cited by Aellen. It is characterized by its upright habit and broader, more nearly hastate leaves. The material has been distributed either as *C. rubrum* or *Atriplex* spp.

Section Pseudoblitum Hook. f.

Members of this section differ from those of Section *Degenia* in having the perianth in most cases free to the base. Sometimes, however, especially in *C. rubrum* and var. *humile*, a varying degree of fusion occurs, even to having adjacent sepals so entirely united that only two broadly rounded tips are apparent instead of the usual three in the lateral, vertical flowers. Even in these cases, however, the other parts in the same flower remain free to or nearly to the base. The two groups, *C. glaucum* and its var. *salinum* on the one hand and *C. rubrum* and its var. *humile* on the other, are so unlike in the amount and distribution of the farinosity and in the relative number of horizontal and vertical seeds as to cast doubt on the relationships within this section, as well as between it and Section *Degenia*. The degree of union of the perianth parts does however seem to be of primary importance.

Leaves densely whitish-farinose beneath, ovate or narrowly ovate, undulate or serrate, not hastate; perianth parts glabrous; horizontal seeds largely exposed by the sepals, numerous in the glomerules.

Leaf margins undulate–dentate, the teeth and tips obtuse; glomerules chiefly ebracteate in small axillary or terminal spikes .... 15. *C. glaucum*

Leaves serrate-dentate or sinuate-dentate, the teeth and tips acute and often involute; glomerules nearly all bracteate .... *C. glaucum* var. *salinum*

Plants glabrous or perianth parts farinose (sometimes very inconspicuously so) as well as leaves; glomerules usually with a single horizontal flower.

Seeds 0.6–0.8 (1.0) mm. broad; glomerules chiefly crowded in short spikes, often very numerous; leaves prominently sinuate-dentate, somewhat hastate, the blades up to 10 (20) cm. long; plants upright, pyramidal .... 16. *C. rubrum*

Seeds 0.8–1.0 (1.2) mm. broad; glomerules chiefly separate; leaves entire or variously few-toothed; plants low, spreading .... *C. rubrum* var. *humile*

15. *C. glaucum* L., var. *glaucum*

Widely distributed from Labrador (Goose Bay. Gillett and Findlay 5777 (OTB.)), Newfoundland, Prince Edward Island and New Brunswick, to Alberta, s. to Maryland, Dist. of Columbia and New Mexico. Much more abundant through southern Canada than in the southern part of its range. In the U. S. more frequent westward than eastward. The plants are readily distinguishable by the numerous small leaves chiefly 1–3 cm. long, very densely farinose beneath, and by the seeds, both horizontal and vertical, always more than half exposed by the small perianth parts.

C. glaucum var. *salinum* (Standley) Boivin (*C. salinum* Standley)

Differing from typical *C. glaucum* only in the more sharply serrate leaves and the more consistently bracteate inflorescence, the two varieties are almost always readily distinguishable in spite of the similarity between them, though not on the basis of seed size (6, p. 593) or length of petiole (4, p. 59). The illustrations in Gleason (9, Vol. 2, p. 91) are adequate in showing the essential differences. Although they are here maintained as varieties they may well be separate species.

More abundant in collections than typical *C. glaucum*, the range of var. *salinum* extends from s.e. Quebec and the James Bay region of Ontario to British Columbia, south to New Mexico and Arizona.

16. *C. rubrum* L.

In its typical form this species has been generally recognized but it and, more especially, its var. *humile* have, like *C. album* in the horizontal-seeded series, served as a catch-all for all sorts of vertical-seeded plants. Although the taxa included in the two sections, *Degenia* with sepals united nearly to the tips and *Pseudoblitum* with sepals free nearly to the base, were indicated by Aellen and Just, it is not easy to discover this from the key characters; " perianth—partly fused, 3-tipped— " leading to the former and " Perianth—3–5 tipped, free to the middle," leading to the latter. Neither does it help within Section *Pseudoblitum* (l.c., p. 59) to arrive at *C. rubrum,* which has leaves with often strongly hastate blades up to 15 cm. long, to have to choose in the key the alternative " Leaves usually smaller [than 5 cm. including the petiole]—not hastate." The contrast in leaf size indicated here is between *C. rubrum* and *C. mexicanum,* the latter a clearly distinct species with horizontal seeds, closely related to *C. urbicum* and *C. murale* and without apparent relation to the members of Section *Pseudoblitum.* It is only when one recognizes in the key to Section *Degenia* (l.c., p. 57) the alternative " Leaves large, up to 10 cm. long and wide " etc., that one suspects that the alternatives have become transposed.

Aellen has considered the smaller, often prostrate plant with leaves less prominently sinuate-serrate, often entire,—*C. humile* Hook., *C. rubrum* var. *humile* (Hook.) S. Wats.,—as merely a forma under *C. rubrum,* separating it on the basis of stature and " leaves entire, ovate-spatulate ". Although in these respects var. *humile* expresses the same relationship to *C. rubrum* as do var. *Degenianum* to *C. chenopodioides* and ssp. *crassicaule* to *C. macrospermum,* it differs also in seed size. Here again it is a bit disconcerting to find, in all treatments that have come to the author's attention, that typical *C. rubrum* is described as having seeds 0.8–1.0 mm. broad and its var. *humile* as having seeds 0.5–0.6 mm. broad. Actually, seeds of *C. rubrum* are usually 0.6–0.8 mm. broad with an occasional terminal one to 1.0 mm. while those of var. *humile* are 0.8–1.0 mm. broad with the terminal ones to 1.2 mm. Some variation occurs, but the smaller seed size is definitely associated with the larger, upright, prominently undulate-serrate-leaved plants (*C. rubrum,* typical), and the larger seed size with the smaller, prostrate, often entire-leaved plants, var. *humile.*

The two taxa are illustrated in Gleason (9, p. 93), both as *C. rubrum,* the right hand illustration being the typical representative of that species, the left, drawn from St. John 1218 (cited below) being var. *humile.*

Although most of var. *humile* is readily separable from typical *C. rubrum,* some intergrading does occur so that the taxon is here maintained in a varietal status. It is much more nearly a separate species than a forma. The following distributions are referred to var. *humile:*

CANADA: Nova Scotia. Sable Island, Wallace Beach. St. John 1218, Sept., 1913 (US., NY., PH.) (cited as *C. rubrum* by Aellen). Pictou Co.: Pictou. Erskine 1632, Sept. 1952 (OTB.). New Brunswick. St. John Co.: Fairville. Fernald, Long and Fogg 232, Sept. 1926 (NY., Penn.). Quebec. Amos. Groh, Sept. 1938 (OTB.). Saskatchewan. Bourgeau, 1957–8 (NY.) (with *C. rubrum*). Alberta. Bonnyville. Groh 1092, Sept. 1939 (OTB.). British Columbia.. Kamloops. Macoun, June 1899 (NY.), cited as f. *humile* by Aellen.

U.S.A.: Massachusetts. Nantucket Island. Bicknell, Sept. 1899 (NY.). North Dakota. Benson Co.: Leeds. Lunell, Sept. 1909 (in part) (NY.). Butte. Lunell, Sept. 1907 (NY.). Nebraska. Grant Co.: 1 mi. n. of Whitman, Rydberg 1782, Sept. 1893. Cited as *C. crassifolium* (= *chenopodioides* var. *Lengyelianum*) by Aellen. The plants in the Rydberg collection are erect, to 2 dm. tall, with thinner leaves and with a slightly greater degree of union of sepals than is usual in var. *humile.* Being somewhat intermediate between this and typical *rubrum,* it is of interest that Rydberg also collected, 3 mi. n.w. of Whitman (Flora of the Sand Hills of Central Nebraska) an upright plant 7 dm. tall, with very numerous small seeds and also with thin leaves (Rydberg 1791 (NY.)), referred to ? *C. crassifolium* × *rubrum* by Aellen and to *C. rubrum* by the present author. These collections indicate that this area might be productive of additional significant material. A plant of similar interest, strictly upright, 4.2 dm. tall but otherwise characteristic var. *humile* was collected at Salina, N. Y., by G. W. Clinton, without date but at least before 1900 (PH.). These collections indicate a need for caution in separating *rubrum* and *humile* specifically and for additional study in this much misunderstood and misrepresented group. Washington. Klickitat Co.: Suksdorf, Nov. 1884 (US., NY.), cited as *C. crassifolium* var. *Degenianum* by Aellen.

Section CHENOPODIA (C. A. Mey.) Aellen

This section includes species with horizontal seeds and a regularly 5-parted perianth. There is considerable variation in leaf shape, in seed size, and in shape and rugosity of the pericarp. The section is divided into 4 sub-sections by Aellen and Just on the basis of the latter character and such a division seems generally to reflect natural relationships; it is not considered necessary, however, in the present treatment, to follow this subdivision. In view of the complexity of the section, the following brief synopsis, based on leaf shape, may be of interest:

Leaves linear or nearly so, entire, usually fleshy; western: nos. **20–23**.

Leaves lanceolate to ovate, not prominently toothed but often hastate: nos. **17, 18, 19, 26, 29**.

Leaves triangular, hardly broader than long, usually thin, mostly hastate and otherwise entire; western: nos. **25, 27, 30–34**.

Leaves variously ovate, 1–3 times as long as broad, hardly hastate, variously toothed: nos. **28, 35–38, 40–48**.

KEY TO THE SPECIES OF SECTION *Chenopodia*

1. Leaves moderately thin, narrowly ovate to broadly linear, conspicuously toothed, several times as long as broad, the sides parallel above the basal lobes, at least to the next pair of teeth; sepals fused to or slightly above the widest part of the utricle; pericarp attached, finely and regularly reticulate, the reticulations not easily visible at 10×; seeds 1.0 mm. broad; rare adventive species .... 40. *C. serotinum*
1. Combination of characters not as above.
   2. Principal leaves linear to narrowly ovate or oblong, chiefly less than 1.5 cm. broad but occasionally to 2.0 cm. across the basal lobes, 2–many times longer than broad, entire or with basal lobes and sometimes additional low teeth in thin-leaved forms, 1–3 nerved or occasionally pinnately veined, petioles shorter than blade, usually less than half the length; pericarp separable and smooth or attached and granular-roughened, never reticulate or alveolate; sepals without definite apiculate tips (plants doubtful as to leaf shape excluded if fruit largely exposed at maturity and maturing prominently mixed in the glomerules).
      3. Leaves chiefly narrowly oblong-ovate or, in larger plants, becoming deltoid-rhombic, 2–3 times as long as broad, the petioles characteristically upwardly curved; inflorescence branches usually not exceeding leaves; seeds maturing prominently mixed in the inflorescence; pericarp separable; sepals exposing mature fruit laterally and dorsally .... 26. *C. atrovirens*
      3. Leaves 3–many times as long as broad; seeds maturing nearly uniformly in the cymes; sepals largely covering fruit at maturity, at least laterally.
         4. Principal leaves narrowly lanceolate or broader, moderately thick to very thin, with or without basal lobes and few additional teeth, 3-nerved or occasionally pinnately veined.
            5. Pericarp markedly separable; seeds rounded dorsally, usually slightly exceeding 1 mm. in width, covered or exposed by the perianth.
               6. Leaves moderately thin to almost fleshy in texture, oblong to lanceolate or ovate-lanceolate, entire or, if with prominent basal lobes, then the terminal lobe lanceolate and less than 0.8 cm. broad; plants upright to low and spreading .... 17. *C. pratericola*
               6. Leaves thin, ovate-lanceolate, variously lobed, toothed or entire at base, if lobed, the terminal lobe tapering, not strongly lanceolate and 1.0 cm. or more wide except in small plants; eastern .... 18. *C. Foggii*
            5. Pericarp attached, minutely granular-roughened; seeds flattened on top, rather prominently exposed; western.

7. Leaves thin, ovate-lanceolate or broader; seeds 1.2–1.5 mm. wide. 29. *C. incognitum*

7. Leaves firm, ovate-lanceolate or narrower; seeds 1.0 mm. wide. 19. *C. hians*

4. Leaves linear or nearly so, chiefly fleshy, one-nerved, the margins entire; western.

8. Pericarp separable; seed 1.2–1.5 mm. wide; sepals sparingly farinose, often presenting a "water soaked" appearance, largely exposing the fruit at maturity; flowers in scattered small glomerules in elongated spikes, maturing mixed in the glomerules .... 20. *C. subglabrum*

8. Pericarp attached.

9. Sepals united to or above widest part of seed, appendaged by an undulate collar from the sinuses; seeds 1.5 mm. broad, rugose, strongly flattened, umbonate .... 21. *C. cycloides*

9. Sepals without an undulate collar from the sinuses.

10. Seeds 1.2–1.5 mm. wide; pericarp tuberculate-roughened; sepals sparingly farinose and appearing "water soaked"; well-grown plants more than 4 dm. tall .... 22. *C. pallescens*

10. Seeds 0.8–1.0 mm. wide; sepals prominently farinose; plants chiefly less than 4 dm. tall .... 23. *C. leptophyllum*

2. Principal leaves deltoid, deltoid-rhombic or ovate, 1–3 times as long as broad, pinnately veined, entire or variously toothed.

11. Leaves entire; sepals with definite minute apiculate tips; seeds 0.9–1.1 mm. broad, largely exposed; pericarp semi-separable to attached .... 39. *C. polyspermum*

11. Leaves variously toothed or entire; sepals without definite apiculate tips.

12. Leaf blades deltoid, rhombic-deltoid or variously ovate (if ovate or narrower, thin in texture) often with basal lobes but otherwise nearly or quite entire; western, except the widely distributed *C. vulvaria* (other eastern material keying out here would be either broader leaved *C. Foggii,* no. 18, or entire-leaved *C. Standleyanum,* no. 35, which see).

13. Branches weak, often prostrate; leaves broadened above the base but not hastate; sepals variously united, at least some for ¾ their length. 24. *C. Vulvaria*

13. Branches erect or if spreading not weak or prostrate; leaves with or without basal lobes; sepals united less than half their length.

14. Pericarp separable.

15. Leaves thin, the blades deltoid or ovate, seeds averaging more than 1.0 mm. broad, maturing mixed in the glomerules and exposed at maturity; plants upright, strict or variously branched.

16. Blades deltoid, 1.0–4.0 (5.0) cm. broad, hardly longer than broad, the base with a prominent hastate lobe; seeds chiefly 1.1–1.5 mm. broad .... 25. *C. Fremontii*

16. Blades ovate, 1.5 cm. broad or less, only occasionally with a basal lobe; seeds chiefly 1.0–1.3 mm. broad .. 26. *C. atrovirens*

15. Leaves membranaceous to coriaceous, less than 1.5 cm. broad, the blades with a basal lobe; seeds 0.9–1.1 mm. broad, maturing relatively uniformly and covered by the sepals; plants profusely branched, low and bushy .... 27. *C. incanum*

14. Pericarp attached.

17. Pericarp smooth or granular-roughened.

18. Seeds 1.2–1.5 mm. broad; leaves thin, ovate, sometimes narrowly so, to 3.5 cm. long; plants upright, small and strict or tall and variously branched .... 29. *C. incognitum*

18. Seeds 0.7–0.8 mm. broad; leaves firm, ovate or deltoid, the largest less than 2 cm. long; plants low, bushy-branched. 30. *C. nevadense*

17. Pericarp variously cellular-reticulate.

        19. Seeds sub-globose, entirely covered by the pointed sepals at maturity; pericarp slightly to prominently whitened; leaves broadest very near the base, the basal lobes not strongly developed; inflorescences prominently leafy.
            20. Pericarp moderately to strongly whitened; glomerules crowded in the inflorescence; pedicellate flowers lacking; leaves firm, nearly coriaceous .... 31. *C. Watsoni*
            20. Pericarp white; glomerules diffuse; pedicellate flowers present; leaves thin or firm .... 32. *C. glabrescens*
        19. Seeds more or less flattened, partially exposed at maturity; pericarp black; leaves usually prominently lobed above the base.
            21. Seeds 1.2–1.5 mm. broad; leaves thin, the lobes usually acute; plants usually freely branching; inflorescences moderately leafy .... 33. *C. neomexicanum*
            21. Seeds 1.0–1.1 mm. broad; leaves thin or firm, broadly triangular, usually with bipartite basal lobes; plants upright with short basal branches and terminal leafless inflorescences .... 34. *C. Palmeri*

12. Blades deltoid, ovate or rhombic-ovate in outline, 2–10 (20) cm. long, longer than broad, at least the lower conspicuously deeply or shallowly toothed above the basal lobes (all but the lower may be entire in *C. strictum* var. *glaucophyllum*).
    22. Leaves thin; fruit maturing very prominently mixed so that mature fruit and young perfect flowers are present in the glomerules at the same time (except in late stages); sepals weakly or not at all keeled, largely exposing mature fruit; pericarp usually separable; seeds more than 1 mm. broad (*C. murale,* with black, strongly adherent pericarp excluded).
        23. Leaves rounded or tapering at base, the teeth short and ascending, gradually reduced to entire bracts subtending most of the inflorescence branches; pericarp smooth, strongly separable; seeds 1.1–1.5 mm. broad .... 35. *C. Standleyanum*
        23. Leaves rounded, truncate or cordate at base, the teeth usually long-tapering and spreading; inflorescence ebracteate or the main branches subtended by rather well-developed leaves; seeds 1.5–2.5 mm. broad.
            24. Seeds 1.5–2.2 mm. broad, lenticular, their margins rounded; pericarp black, thickish, cellular-reticulate, attached; sepals ovate, their edges meeting to overlapping, covering at least more than half of the mature fruit; cymes open, often diffuse, in the cylindric to somewhat pyramidal panicles; leaves truncate-cordate at base; European .... *C. hybridum*
            24. Seeds 1.5–2.5 mm. broad, umbonate-lenticular, their margins obtuse to moderately acute; pericarp whitish to yellow-green, thin and delicate, cellular-reticulate, readily separable or attached; sepals ovate to broadly linear, their margins meeting or separated by as much as their width and exposing more than half of the mature fruit; cymes occasionally open but more often contracted, nearly or quite glomerulate, on spike-like branches of the pyramidal panicles; leaves rounded, truncate or slightly cordate at base; American .... 36. *C. gigantospermum*
    22. Leaves thin, membranaceous or coriaceous; flowers in the glomerules in nearly the same stage of development (occasionally later pistillate flowers present, especially in late season forms).
        25. Leaves all strongly deltoid and prominently sinuate-dentate or only the few uppermost reduced to entire lanceolate bracts; stigmas short (0.1 mm. or less) and stout; seeds irregularly roughened; pericarp strongly adherent; sepals obtuse, largely exposing fruit; plants rarely exceeding 4.0 dm. in height.

26. Seeds 1.2–1.5 mm. broad, the margins acute; sepals keeled, farinose; inflorescences somewhat cymose, shorter than the leaves. 37. *C. murale*

26. Seeds 1.0–1.2 mm. broad, the margins rounded; sepals not keeled or farinose; inflorescences spicate or narrowly paniculate, usually exceeding the leaves .... 38. *C. urbicum*

25. Leaves rhombic-ovate, variously toothed, gradually reduced upward to entire lanceolate bracts (except in some southern robust plants more than 2 m. tall); stigmas long or short but not stout.

27. Seeds essentially smooth; pericarp smooth or inconspicuously irregularly roughened; leaves chiefly membranaceous in texture; sepals usually not strongly keeled, the keel rarely as much as ¼ the width of the sepal (*C. opulifolium* and some forms of *C. album* may have more strongly keeled sepals); style divided essentially to base.

28. Pericarp thin and strongly separable; leaves moderately thin; sepals strongly farinose to the tip; s.e. U. S. . . 28. *C. albescens*

28. Pericarp usually attached but varying to separable; sepals with a hyaline or yellowish less farinose border; widely distributed.

29. Leaf blades rarely exceeding 6.0 cm. long, variously toothed but hardly sharply doubly sinuate-dentate, the upper reduced to entire lanceolate bracts.

30. Seeds chiefly 1.1–1.5 mm. broad; plants not restricted in flowering time; sepals largely covering fruit.

31. Blades little or not at all longer than broad, basal lobes often bipartite; sepals united to or above broadest part of fruit, usually strongly keeled. 41. *C. opulifolium*

31. Length of blades 1½ or more times the width; sepals not united to broadest part of fruit, variously keeled .... 42. *C. album*

30. Seeds 0.9–1.2 mm. broad.

32. Plants in flower second week in September; sepals largely covering fruit; inflorescence branches densely flowered, arching; lower and median leaves not more than 1½ times as long as wide, coarsely toothed, the lower more or less doubly so at base .... 43. *C. missouriense*

32. Plants not restricted in flowering time; sepals exposing fruit at maturity; flowers in distinct or close glomerules in strict axillary spikes or terminal loose panicles; lower leaves low-serrate, the median oblong, entire. 44. *C. strictum* var. *glaucophyllum*

29. Leaves large, the blades 5–10 cm. long, the lower doubly sinuate-dentate with sharp teeth, the upper reduced to sharply serrate or occasionally entire bracts, strongly farinose, the farinules often tinged red on young leaves; plants robust, 1–3 (?) m. high; plants presumably restricted in flowering time; southern states. 45. *C. giganteum*

27. Pericarp and surface of seeds foveolate-reticulate; leaves thin-membranaceous, membranaceous or nearly coriaceous in texture.

33. Seeds chiefly 1.0–1.5 mm. broad; style base often prominent (though less than 0.1 mm. long); leaves thin to coriaceous; sepals with a prominent winged keel often equaling half the width of the sepal; chiefly Gulf states, Mississippi valley and westward .... 46. *C. Berlandieri*

33. Seeds 1.3–2.0 mm. broad; style base less prominent or lacking; leaves thin-membranaceous to membranaceous in texture; perianth parts less prominently winged.
  34. Seeds 1.5–2.0 mm. broad, relatively flat; leaves thin-membranaceous, relatively large (those of the main axis in vigorous plants up to 15 cm. long); flowering during latter half of August; large plants of cultivated ground and waste places; Mississippi valley, eastward and northeastward .... 47. *C. Bushianum*
  34. Seeds chiefly 1.4–1.6 mm. broad; leaves membranaceous or somewhat thinner, the larger ones 5–6 cm. long, the upper reduced to linear-lanceolate bracts which are conspicuous in the inflorescence; perianth parts usually enlarged around fruit and with prominent keels but not winged; generally smaller plants with spreading habit, chiefly on the coastal plain, frequently on sea beaches. 48. *C. macrocalycium*

17. *C. pratericola* Rydb. Bull. Torr. Bot. Club 39: 310. 1912.

Leaves lanceolate to ovate-lanceolate, lobed or unlobed; sepals relatively yellowish, acute and ascending, less prominently keeled; plants erect, often strict .... var. *pratericola*

Leaves chiefly oblong-elliptic, usually of thicker texture, unlobed; sepals relatively greenish, obtuse, more definitely curving inward over the fruit and more prominently keeled; plants upright-spreading to low and diffuse .... var. *oblongifolium*

The plants included here have been generally known under the name *C. leptophyllum* Nutt.; the proper application of this name is discussed under no. 23. They constitute a typically western group, fairly common in all the states west of the Mississippi River, but probably more so in the plains than in the montane areas. They also occur in Mexico, in the western Canadian Provinces north to the Mackenzie Basin, and in Alaska. Thus the species occupies essentially the same territory as *C. Berlandieri* (no. 46). It has been more successful than *C. Berlandieri* as an eastern immigrant, however, and is sparingly established in sandy areas in the eastern states, more frequently northward and along the Atlantic coast.

There is considerable variation in habit and leaf width and texture and some in seed size and sepal characters, but the small seeds, rounded upward to the style base and with the chocolate-brown to nearly black pericarp releasing freely from the seed with the slightest assistance, constitute a unifying set of characters.

17a. *C. pratericola* Rydb. var. *pratericola*

C. petiolare var. *leptophylloides* Murr. in Bull. Herb. Boiss., 2 ser., 4: 994. 1904.

C. pratericola var. *Thellungianum* Aellen in Ostenia 1933, p. 100.

C. pratericola var. *leptophylloides* (Murr.) Aellen in Fedde Rept. Sp. nov. 26: 64. 1929. (As to western broad-leaved plants.)

The common form of the species is a generally upright plant, often strictly so, with lanceolate to narrowly ovate-lanceolate usually entire leaves but occasionally with prominent basal lobes. Rydberg's type and description refer to the broader-leaved extreme included under var. *leptophylloides* (Murr.) Aellen but the entire series seems referable to a single taxon.

Less common throughout the same general range but apparently better represented in the montane portion is the usually more spreading form with the tendency toward thicker, more oblong leaves and more obtuse, greener and more strongly keeled sepals. This intergrades continuously with var. *pratericola*. Maintaining it in a varietal category under *C. pratericola* necessitates the following combination:

17b. *C. pratericola* var. **oblongifolium** (S. Wats.) comb. nov.
C. leptophyllum var. *oblongifolium* S. Wats. in Proc. Amer. Acad. 9: 95. 1874.
C. desiccatum A. Nelson in Bot. Gaz. 34: 362. 1902.
C. oblongifolium Rydb. in Bull. Torr. Bot. Club 33: 137. 1906.
C. pratericola ssp. *desiccatum* (A. Nelson) Aellen in Fedde Rept. Sp. nov. 26: 136. 1929.

It is difficult to draw any clear-cut line of separation between var. *pratericola* and var. *oblongifolium*. Relatively more material would be included under var. *oblongifolium* on the basis of sepal characters used in the present treatment than had been included by previous authors chiefly on the basis of the low, spreading habit. The parallelism between typical *C. pratericola* and its var. *oblongifolium* and typical *C. album* and its var. *lanceolatum* is marked. In both cases the segregated var. has a more branching habit, narrower leaves and more obtuse, greener sepals with a generally more strongly winged midrib.

18. **C. Foggii** *sp. nov.* Fig. 1. Plantae gracile erectae, ramosae vel nonramosae, 2–10 dm. altae. Laminae foliorum tenues, anguste ovatae, 1–4 cm. longae, 0.5–1.8 cm. latae, integrae vel sub medio 2–4 dentibus, subtus farinosae, basi in gracile petiolum minus quam dimidiam longitudinis laminae attenuatae. Flores in spicis brevibus ad apicem plantae. Perianthii laciniae 5, anguste carinatae, fructum in maturitate includentes. Pericarpium tenue, fuscum, minute echinatum, libere a semine separabile. Semen nigrum, lucidum, 1 mm. in diametro.

Plants slenderly upright, branched or unbranched, 2–10 dm. tall. Leaf-blades thin, narrowly ovate, 1–4 cm. long, 0.5–1.8 cm. broad, entire or with one or two pairs of teeth below the middle, farinose beneath, tapering at the base to a slender petiole less than half the length of the blade. Flowers in short spikes near top of plant. Sepals 5, farinose, narrowly keeled, covering the fruit at maturity. Pericarp thin, brown, minutely echinate, freely separable from seed. Seed black, shining, 1 mm. in diameter.

This noteworthy development of an eastern relative of the widely distributed western *C. pratericola* includes a series of plants with thin, ovate or narrowly ovate leaves and strict habit, in the Appalachian and Great Lakes Region of eastern North America, where they occur as native plants in woodland habitats. The leaf shape is essentially that of western *C. incognitum* of this treatment. The material has generally been referred to *C. Standleyanum* (as *C. Boscianum*), to which it may also be related. It differs from this species in having the fruit nearly or quite covered by the more farinose and more strongly keeled lobes of

the calyx and maturing relatively uniformly in the glomerules. In these respects it is similar to *C. album* and *C. pratericola*. From *C. album* it differs in the readily separable pericarp and thin, narrowly ovate leaves, entire or with basal lobes. It probably would be included under *C. pratericola* var. *leptophylloides* (Murr.) Aellen of Aellen and Just's treatment, although, as previously indicated, the varietal name *leptophylloides* refers to typical *C. pratericola* Rydb. It was collected in s.e. Va. and recognized as a probably undescribed taxon by my associate, Dr. John M. Fogg, Jr.

The following collections have been seen:

CANADA: Quebec. Pontiac Co.: Shallow soil on granite ledges, n. side of Ottawa River. Breitung 7133, July 1948 (OTB.). Leeds Co.: Thousand Islands, Smoke Islands. Bicknell, Sept. 2, 1905 (NY.).

U.S.A.: Maine. York Co.: South Berwick. Parlin, Sept. 3, 1898 (GH., NEBC.). Androscoggin Co.: East Auburn. Merrill, June 21, 1896 (NEBC.). Vermont. Orange Co.: Fairlee. Pease, Aug. 4, 1928 (NEBC.). New Hampshire. Coos Co.: Summit of Hart's Ledge, Hadley's Grant. Pease, Sept. 9, 1915 (NEBC.). Cheshire Co.: Rocky woods, Fall Mt., Walpole. Fernald, July 31, 1900 (GH.). Carroll Co.: Dry rocky woods, w. slope of White's Lodge, Bartlett. Pease, Sept. 8, 1915 (NEBC.). Grafton Co.: Haverhill. Fernald, Aug. 18, 1917 (NEBC.). Massachusetts. Berkshire Co.: New Marlboro. Hoffmann, Aug. 28, 1920 (NEBC.). Rocky woods, Bash Bish Falls, Mt. Washington. Hoffmann, Sept. 9, 1919 (NEBC.). New York. Rensselaer Co.: Nassau. McVaugh 2142, Aug. 1933 (Penn.). Westchester Co.: Lowerre. Bicknell 3996, July 1891 (NY.). Pennsylvania. Luzerne Co.: 1.5 mi. w. of Mountain Top. Glowenke 8823, Aug. 1946 (Penn.) [**Type**]. Pike Co.: Matamoras. Glowenke 2556, July 1938 (Penn.). Monroe Co.: Shawnee on Delaware. Glowenke 689, July 1937 (Penn.). Carbon Co.: Harrity. Wherry, Aug. 13, 1951 (Penn.). Berks Co.: Moselem (shaded hillside). Britton, July 4–8, 1915 (NY.). Bradford Co.: Overton Twp. Westerfeld 1045, Aug. 1941 (Penn.). Clinton Co.: Shintown (roadside along sandstone cliff). Westerfeld 5722, Aug. 1952 (PAC.). Virginia. Rockingham Co.: Exposed, steep, cleared mountainside near top of Shenandoah Mt. Leeds 223, July 1931 (PH.). Giles Co.: dry slope of Peters Mt. 1 mi. n. of Narrows. Fogg 17367, July 17, 1940. North Carolina. Haywood Co.: Chambert Mt., 3 mi. n. of Clyde. Smathers 79, July 1938 (PH.). Illinois. Will Co.: Mokena, open woods. Chase 2010, Sept. 1902 (Ill.). Mason Co.: Forest City. Oak woods. Steyermark 68849, Aug. 1949 (Ill.). Minnesota. Millelacs Co.: Milaca. Sheldon, July 1892 (Ill.).

19. *C. hians* Standley .

A greater amount of variation occurs between the plants included under *C. hians* than in other narrow-leaved taxa. Typically the plants are rather narrowly upright with moderately thick, ovate-lanceolate leaves, seeds 1.0 mm. broad, exposed by the sepals, and with the crowded spikelets of glomerules giving the entire plant a strongly virgate appearance. Occasionally, however, plants which seem to belong here are low-branching, and these occur especially toward the region of northwestern U. S. and southwestern Canada. An extreme is represented by several plants from west-central California (Inyo and Mono Counties), northern California (Siskiyou Co.) to s.w. Washington (Grant Co.) in which the leaves are narrower, the plants branched from the base and the glomerules separate in vertical leafless spikes. They are definitely toward *C. leptophyllum* as treated here and by Aellen;—*C. inamoenum sensu* Standley. They may represent only the variation within the species and, indeed, this type of variation is common in *Chenopodium*, being represented by var. *lanceolatum* in *C. album*, var. *oblongifolium* in *C. pratericola*, var. *humile* in *C. rubrum*, etc. However, the species

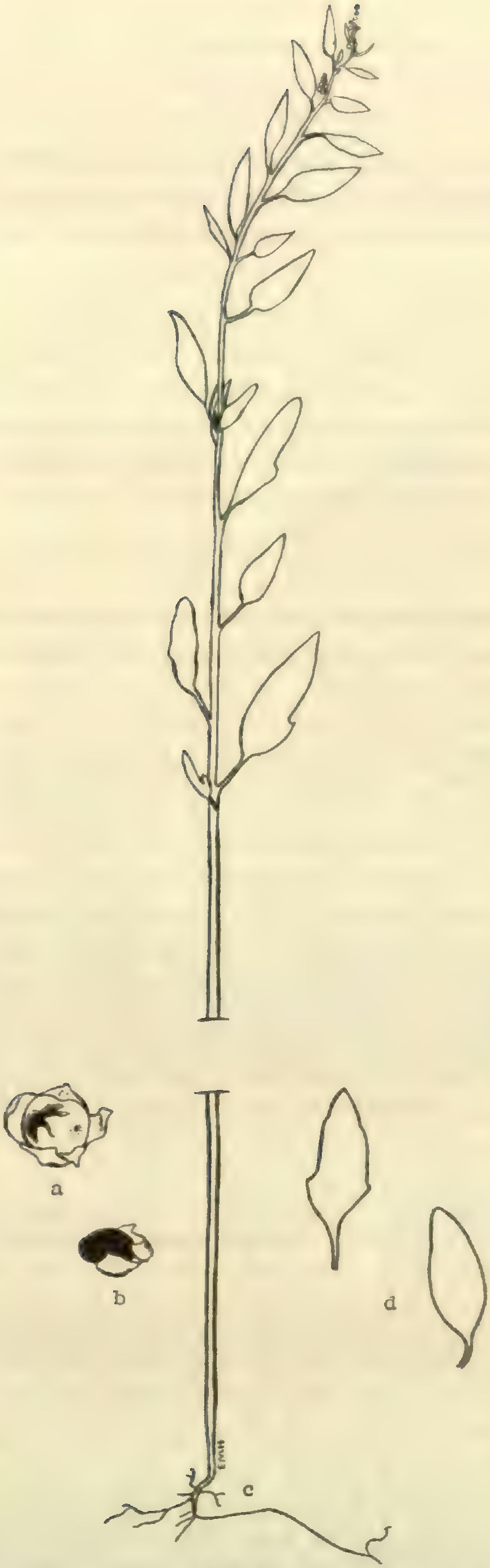


Fig. 1.

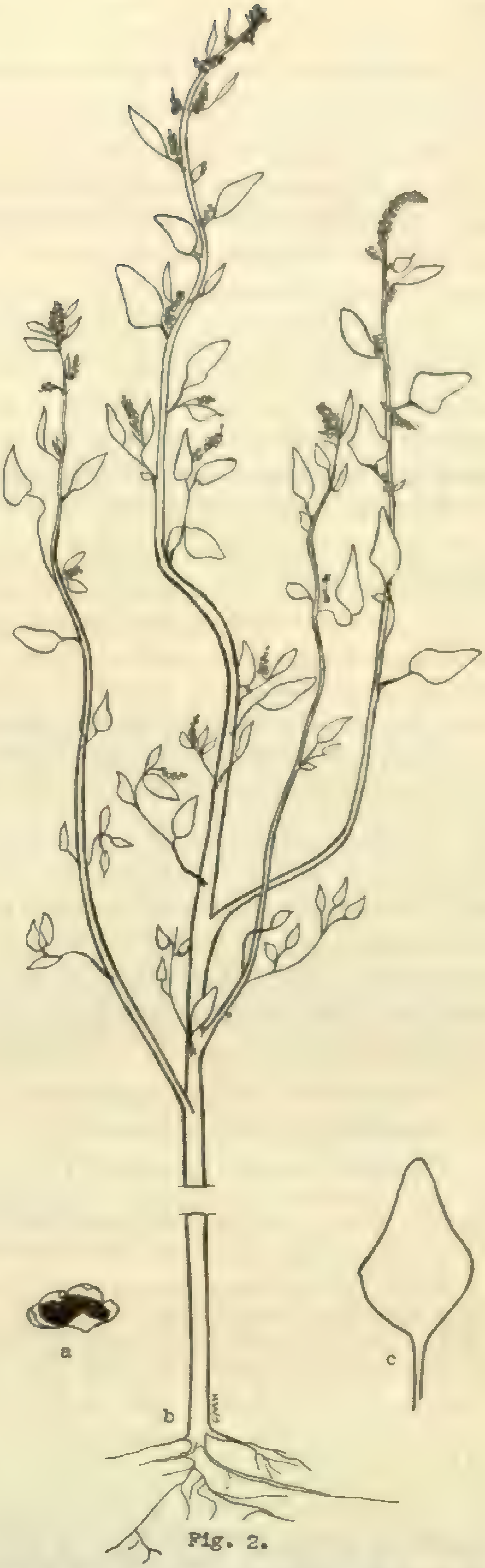


Fig. 2.

Fig. 1. *Chenopodium Foggii: a*, fruit and calyx; *b*, fruit and separable pericarp; *c*, plant; *d*, lower leaves.

Fig. 2. *Chenopodium incognitum: a*, fruit and calyx; *b*, plant; *c*, lower leaf.

leaves one with a strong feeling that it is not genetically homogeneous and may consist of more than one recognizable taxon. Some of it differs from *C. pratericola* only in the attached pericarp. There is, however, a good nucleus of material with the characters given for the species and these will not go into any other category. It may be significant that in the material cited under *C. hians* by Aellen (p. 137) the comment " nicht typisch " occurs with greater frequency than in any other series of citations.

Also, a " typical appearance " may be misleading. The plants distributed as Suksdorf 11536, near Bingen, Klickitat Co., Washington, belong to *C. strictum* var. *glaucophyllum.* The virgate habit here is atypical but after looking over a number of series in the *pratericola* and *atrovirens* groups, in which the perianth parts are farinose to the tips, the strongly rounded, hyaline-margined sepals of *C. strictum,* more characteristic of the *album* group, are immediately impressive. Also the leaves, although appearing at first glance to be entire, are actually minutely serrate.

C. hians is closely related to the *pratericola* group on the one hand and to the *atrovirens* group on the other. If one is looking for intergradations in the western species of *Chenopodium, C. hians* is a good place to begin. It would not be difficult, and, indeed, material may be accumulated, to connect it varietally with both of these groups. From *atrovirens* to *Fremontii* and *incanum* and from *pratericola* and its various relatives even to *C. album* is not much of a jump. Thus the smooth-seeded series would be included under a single species and, for those who consider the reticulate-seeded taxa, represented especially by the numerous forms of *C. Berlandieri,* to be merely forms of *C. album,* nearly all the horizontal-seeded chenopods could be united under a single specific name! *C. hians* merits continued study. Realizing the group as treated here may be polymorphic, it is purposely maintained in a specific category with the thought that further study may clarify its various components as has been the case with eastern taxa with which the opportunity for field experience has been available to the author. The following collections have been seen:

CANADA: British Columbia. Fort St. John. Groh 3040, Sept. 1946. " Nicht typisch ". (OTB.). Alberta. Peace River. Groh 2755, 2756, Aug. 1946 (OTB.). Saskatchewan. Meadow River. Breitung 8314, Aug. 1949 (or Alberta?) (OTB.). North Branch of Saskatchewan River. Brown 1508, Aug. 1908 (branching form) (NY.). The Sask.-Alta. collections are typical in appearance.

U.S.A.: Wyoming. Yellowstone Lake. Nelson and Nelson 6641, Aug. 1899 (NY.). Low branching form, larger seeds. Cited by Aellen under *C. pratericola* ssp. *desiccatum* and referred to *C. desiccatum* by Standley, but the pericarp is strongly adherent. Colorado. Pitkin. Underwood and Selby 413a, Sept. 1901 (NY.). Twin Lakes. Wolfe 258, Aug. 1873 (NY.). Referred to *atrovirens* by both Standley and Aellen. Utah. Abajo Mountains. Rydberg and Garrett 9728, Aug. 1911 (NY.). Referred to *atrovirens* by both Standley and Aellen. New Mexico. Standley and Bollman 10764, cited by Aellen, may be mentioned here as being considered " typical ". Arizona. Coconino Co.: 5 mi. s. of Cameron. Kearney and Peebles 12914, Sept. 1935 (NY.) (typical). Vicinity of Flagstaff. Schollett, Aug. 30, 1943 (Penn.) (typical). California. Inyo Co.: Desert slopes near Big Pine Creek at foot of trail to Big Pine Lakes. Ferris 8976, July 1934 (NY.). Mono Co.: Inyo National Forest. Maguire and Holmgren 26158, Aug. 1945. Siskiyou Co.: Gazelle. Heller 13904, July 1925 (NY.). Washington. Grant Co.: Vantage. Thompson 6787 (NY.). Oregon. Klamath Falls. Peck 9452, July 1920 (NY.).

20. *C. subglabrum* (S. Wats.) A. Nelson is relatively northern in its distribution and easily recognizable by the narrow spikes of strongly separated glomerules. It is the only linear-leaved species known with separable pericarp. The plants occur chiefly in sandy places, often on sand bars in rivers. In addition to the collections cited by Aellen from Washington, Montana, South Dakota and Nebraska, the following have been seen:

CANADA: Saskatchewan. Saskatoon District. Hudson 786, Aug. 1951 (OTB.). District of Swift Current. Boivin and Lodge 6664, July 1949 (PAC.).

U.S.A.: Wyoming. Willow Creek. Nelson 628, July 1894 (Ill.). North Dakota. Slope Co.: Stevens 887, July 1946 (OTB.). South Dakota. Cheyenne River. Wallace, 1896 (NY.). Nebraska. Pine Ridge. Webber, July 1889 (NY.). Scotts Bluff Co.: Scotts Bluff. Rydberg 320, July 1891 (NY.). Sheridan Co.: Hatcher, July 1886 (NY.). Cherry Co.: Chesterfield. Bates 6662, Aug. 1917 (NY.). Colorado. Wooton. Rusby, Sept. 1909 (NY.). Utah. Carrington Island (Great Salt Lake). Watson 971, June 1869 (NY.).

21. *C. cycloides* A. Nelson

Very distinct in having the perianth with a collar-like proliferation from the sinuses. No material of this rare species has been seen other than the two sheets from New Mexico and one from Kansas (the type) cited by Aellen, p. 153.

22. *C. pallescens* Standley

Of relatively southern distribution in comparison to *C. subglabrum*, which it resembles, *C. pallescens* differs from that species in its less delicate habit and especially in having a thickish, tuberculate pericarp firmly attached to the seed. Material seen and previously reported from a relatively narrow northeast-southwest area extending from Missouri southwestward through Oklahoma, Texas and New Mexico. The following record constitutes an extension of this range northeastward to central Indiana: Clinton Co.: south side of railroad 1 mi. w. of Forest. Ek, July 4, 1941 (NY.). Also, within its previously indicated range:

Missouri. Jackson Co.: Courtney. Bush 8613, Aug. 1918 (NY., Ill.); 11942, Aug. 1930 (NY.). Barrens w. of Independence. Mackenzie, June 1899 (NY.). New Mexico. Chaves Co.: Roswell. Earle and Earle 326, Aug. 1900 (1920?).

23. *C. leptophyllum* Nutt. in Moquin in D. C. Prodr. 13(2): 71. 1879.
C. inamoenum Standley in N. Am. Fl. 21: 15, 1916, as to description and plants considered, but not as to type.
C. leptophyllum in part *sensu* Standley, l.c., p. 14.

The name *leptophyllum* has long been used by American authors for the broader leaved, separable-pericarp species, *C. pratericola* Rydb., but the description by Moquin " . . . foliis lanceolato-linearibus vel linearibus . . . " would seem to exclude that name, and Aellen (3) reports the type at Kew is indeed the plant treated as *C. inamoenum* by Standley.[3] The plants may be strict or branched in habit and it is entirely possible that more than one taxon is here included. In comparison to the other linear-leaved species, *C. leptophyllum* has an essentially Rocky Mountain distribution, occurring in Montana, Wyoming, Colorado, Utah, New Mexico, Arizona and Nevada, with one collection from western Texas (Fort Davis), one from Oregon (" P " Ranch) and the original report from California.

---

[3] Standley's type of *C. inamoenum* was actually not the same as the plants described, so the name can also stand, but not in the sense in which it has been used by American authors. The type of *C. inamoenum*, Mearns 2286, Mexican boundary near White Water, Sept. 11, 1893, U. S. National Herbarium No. 233970, consists of the upper portion or end of a branch of a plant on which the leaves are oblong-linear, to 5.0 mm. broad, but the lower leaves must have been nearly ovate. The seeds are about 1.0 mm. wide, relatively flat and with pericarp attached. It does not agree with any other material seen.

WYOMING. Laramie. Johnson 88, July 1905 (NY.). Hams Fork and La Barge. Curtis, July 1900 (NY.). Snake Cankon. Wehmeyer, Martin and Loveland 5410, July 1940 (NY.). COLORADO. Buena Vista. Underwood and Selby, Sept. 1901 (NY.); Sheldon 5816, July 1892 (NY.). Cheyenne Mt. Clarke, Sept. 1895 (NY.). Wray. Schantz (NY.). Gunnison. Underwood and Selby, Sept. 1901 (NY.). Twin Lakes. Jones 907, Sept. 1878 (NY.). NEW MEXICO. Socorro County.: Foothills east of Rentfrow's " desert claim ". Eggleston 19363, Sept. 1923 (NY., US.). UTAH. Southeastern Utah. Abajo Mts. Rydberg and Garrett 1954, Aug. 1911 (NY.). Between Moab and Monticello. Rydberg and Garrett 9117 and 9119, July 1911 (NY.). Summit Co.: Stevens Dairy Farm (NY.). Modena. Davis, Sept. 1930 (NY.). NEVADA. Esmeralda Co.: Indian Creek. Archer 7227, Sept. 1938 (NY., OTB.). 3 mi. s. of Hubbard C.C.C. Camp on U.S. 93. Holmgren 1584, July 1941. The two Nevada sheets differ in having reddish stems.

24. *C. Vulvaria* L.

A native of Europe, widely introduced elsewhere, this species probably is not closely related to the others here included. It is semi-prostrate in habit and in its vegetative features resembles overgrown *Stellaria media.*

25. *C. Fremontii* S. Wats.

This species is the best known and most widely distributed of the triangular-leaved group and is characterized by the broad, thin, hastate leaves, hardly longer than broad (Fig. 14), upright habit, and seeds free from the pericarp maturing mixed in the glomerules and largely exposed. Like some other species such as *C. album* and *C. rubrum* the name has been too comprehensively used on herbarium sheets, although the botanists of the early part of the century distinguished it well.

Fosberg (7) considered *C. atrovirens* and *C. incanum* as being only varietally distinct from *C. Fremontii,* but the relationships assume an entirely different aspect when all the taxa are separated. The recognition of *C. incognitum* removes the apparent continuity between *Fremontii* and *atrovirens* and the following forma (which may be better treated as a variety) includes those plants which seem to intergrade with *C. incanum.*

C. Fremontii f. *farinosum* Aellen, Fedde Rept. Sp. nov. 26: 142. 1929. The smaller, thicker, more grayish-farinose leaves of this form resemble those of *C. incanum* but the habit and seed characters are those of typical *Fremontii.*

C. Fremontii is widely distributed from Saskatchewan to Texas, westward to the Cascade Mts. Citations of the abundant typical material are not thought necessary but the following may be of interest as representing forma *farinosum:*

CANADA: BRITISH COLUMBIA. Radium Hot Springs. Groh, Aug. 1933 (OTB.).
U.S.A.: OREGON. Wheeler Co.: Mitchell. Peck 10113, July 1921 (NY.). Crook Co.: Along Deschutes River 6 mi. below Bend. Peck 9744, Aug. 1920 (NY.). UTAH. Slope of Aquarius Plateau. Ward 468, July 1875 (PH.). La Verken. Jones 5184, May 1894 (NY.)

(though cited by Aellen under *C. incanum,* it has the larger, flatter seeds of *C. Fremontii*). TEXAS. Davis Mts., Trans-Pecos. Hinckley 973, July 1937 (NY.) (good extreme). Brewster Co.: Near Castellan. Palmer 34220, May 1928 (NY., PH.). Chisos Mts. Mueller, July 1932 (Ill.) (good extreme). ARIZONA. Tucson. Griffiths and Thornber 3351, Sept. 1902 (NY.). Near Powell. Griffiths 1558, Sept. 1900 (NY.). NEVADA. Clark Co.: Kyle Canyon. Clokey 7913, Aug. 1938 (NY.). Storey Co.: 2½ mi. n. of Virginia City. Aellen 493, Aug. 1937 (OTB.) (good extreme).

C. Fremontii var. *Pringlei* (Standley) Aellen (*C. Pringlei* Standley), cited from North Dakota and Mexico, differs in having the leaves serrate. The few sheets seen give the impression of representing specific rather than varietal distinctness. It has not been studied.

26. *C. atrovirens* Rydb.

Related to but distinct from *C. Fremontii,* in its different leaf shape and generally firmer texture, and in having slightly smaller seeds, *C. atrovirens* is also closely related to *C. hians,* from which it may not really be distinct, as discussed under the latter species. Small plants are characteristic in having axillary inflorescences shorter than the strongly upright-ascending leaves, but in larger plants the inflorescence becomes terminal and diffuse. Such larger plants might be confused with small plants of the eastern *C. Standleyanum* if their ranges overlapped, although the serrate leaves and the more exposed fruits of the latter are distinctive.

Some of the variation within the species might be resolved if the smaller, stouter plants with more densely spicate inflorescences, *C. aridum* A. Nelson (*C. Wolfii* Rydb.), could be segregated. They may form a connecting link between this and *C. hians.*

The species occupies essentially the montane portion of the range of *C. Fremontii.* Previously reported from North Dakota (" in garden " and so probably introduced) to New Mexico, west to Oregon and California, the following record extends its range to

BRITISH COLUMBIA. Five miles w. of Fort St. James. McCabe 7489, June 1940 (NY.).

27. *C. incanum* (S. Wats.) A. A. Heller.

This is a relatively easily recognizable and fairly uniform taxon, characterized by its low, bushy habit and small, thick leaves, with a prominent, often sharp, lobe on either side above the base. The seeds average about 1.0 mm. in diameter and are covered by the sepals at maturity.

Aellen has cited a number of collections and others have been seen indicating a range from South Dakota south and southwest to Texas, Mexico and southern California. It is a plant of arid rather than montane habitats, with its greatest concentration in the southwestern states. In view of this distribution, it is a bit surprising to find the following two collections from southern Canada:

Dry alkaline flat (a few plants) 20 mi. w. of Govanloch, s. SASKATCHEWAN-ALBERTA border. Frankton and Bibby 276, June 1947 (OTB.). SASKATCHEWAN. Dry soil near Battle Creek. Breitung and Budd 5229, July 1947 (OTB.).

28. *C. albescens* Small

Material to be referred to this species has been somewhat in doubt and there seems to be little of it in herbaria. A sheet of the type collection from Kerrville, Kerr Co., south-central Texas, Heller 1928, June 1894, in the collection of the Academy of Natural Sciences of Philadelphia, shows a portion of a plant which must have been nearly or quite 1 meter high, freely branching, and generally resembling *C. album* in appearance. The basally lobed leaves, not strongly serrate above the lobes, the sepals strongly farinose to the very tips and the thin, separable pericarp place it apart from this species and characterize it as a relative of the western representatives of the genus with more or less deltoid basally lobed leaves centering around *C. Fremontii, C. incanum,* etc. It is certainly the most *album*-like member of its group.

In addition to the type mentioned above, only the following three collections have been seen: TEXAS. Bexar Co.: San Antonio. Jermy (NY.). Bexar Co.: Jermy, June 1904 (NY.). The two sheets probably represent the same collection, not far from the type locality. NEVADA. Lander: Vicinity of Trout Creek. Goodner and Henning 1040, Aug. 1937 (NY.). One can hardly say the previous doubt about the species has been as yet cleared up.

29. **C. incognitum** *sp. nov.* Fig. 2. Plantae erectae, 3–12 dm. altae, e basi ramosae, ramis arcuate ascendentibus. Laminae foliorum tenues, ovatae vel deltoideo-ovatae, 1.5–3.5 cm. longae, non-lobatae vel lobis parvis basalibus, subtus farinosae. Flores in spicis glomeratis terminalibus et axillaribus condensati. Perianthii laciniae 5, farinosae, anguste carinatae, fructum usque ad dimidium in maturitate includentes. Pericarpium minute rugosum, semini adnatum. Semen nigrum, complanatum, 1.2–1.5 mm. diametro, margine rotundato.

Plants upright, 3–12 dm. tall, branched from the base, the branches arcuate-ascending. Leaf blades thin, ovate to deltoid-ovate, 1.5–3.5 cm. long, unlobed or with small basal lobes, farinose beneath. Flowers crowded in terminal and axillary glomerate spikes. Sepals 5, farinose, narrowly keeled, about half covering the fruit at maturity. Pericarp finely rugose, attached to the seed. Seed black, flattened, 1.2–1.5 mm. in diameter, the margin rounded.

The recognition of *C. incognitum* as a species closely related to the *atrovirens-Fremontii* complex materially clears up the specific relationships and segregations in this group. It has the ovate leaf shape of the former, the seed size and general habit of the latter and an attached pericarp definitely unlike either. The smaller plants, up to 4 dm. high, are strikingly similar in appearance to *C. atrovirens,* but the plants may reach three times this height and then have a marked habital resemblance to *C. Fremontii.* A large plant, Standley and Bollman 11012, is the basis of Aellen's report of the eastern *C. Standleyanum* in New Mexico.

Material is known from Wyoming, Colorado, Utah, New Mexico, Oregon and California. Thus it occurs within the range of both *C. atrovirens* and *C. Fremontii.* Habitats indicated on some of the sheets suggest it is more of a woodland species than its relatives and that it may flourish in disturbed soil. These are also the habitat preferences of *C. Standleyanum.* The following distributions have been seen:

Wyoming. Carbon Co.: Copperton. Tweedy 4499, Aug. 1901 (NY.). Colorado. Sheephorn Divide, near a corral. Shear and Bessey 4012, Sept. 1898 (NY.). Near Pagosa Peak. Baker 301, Aug. 1899 (NY.). Mt. Elbert, El. 10,000 ft. Coulter, July 27, 1873 (PH.). Utah. Wasatch Mountains, e. of Manti. Coville and Tidestrom 45, Aug. 1908 (US.). Elk Mountains, near Scorupis Camp. Rydberg and Garrett 9556 and 9556a, Aug. 1911 (NY.). Abajo Mountains. Rydberg and Garrett 9645. Aug. 1911 (NY.). Sevier Co.: Fish Creek Canyon. Garrett 2574, Aug. 1909 (NY.). New Mexico. Rio Arriba Co.: Pine Woods, vicinity of Brazos Canyon. Standley and Bollman 11012, Sept. 1914 (US.) [**Type**]. Oregon. Baker Co.: Cornucopia. Jones, July 1935 (a bit young but seems to be this rather than *atrovirens*) (Ill.). California. Siskiyou Co.: South Fork of Salmon River near Big Flat. Howell 13316, July 1937 (NY.). Siskiyou Co.: Janes Canyon, Siskiyou Mts. Wheeler 3709, July 1935 (NY.). Tehama Co.: Red Fir Forest, South Yolla Bolly Mts. Munz 16892, July 1951 (PAC.). Plumas Co.: Little Grizzly Ranger Station. Eggleston 7576, Aug. 1911 (NY.). Tulare Co.: Head, East Fork of Kaweah. Culbertson 4582, Aug. 1904 (NY., Penn.). Los Angeles Co.: Mt. Islip, San Gabriel Mts. Fosberg and Ewan 35523, Aug. 1931 (NY.). On disturbed soil, Swartout Valley, San Gabriel Mts. Munz 7659, Aug. 1923 (NY.).

30. *C. nevadense* Standley

This is one of the " neatest " of species in its small compact appearance as a plant, its distinctness from other taxa, and in its definite and limited geographic range. Its characteristics have been adequately described by Fosberg (7). The very small seeds and numerous pedicellate flowers are distinctive. The latter feature occurs in a few other species but in no case is it nearly so pronounced.

It has been generally recognized in its older stages (August) by its compact habit and small seeds but when collected in the young condition (June) it presents a somewhat different aspect and is not always correctly identified by collectors. In its younger stages it is a relatively delicate plant with gracefully spreading branches, small rhombic-hastate strongly ascending leaves and often red stems. The compact habit develops later and the leaves are often completely shed while the plant is still in good fruit. It has the most marked development of a distinct, though small, tap root that has been observed in *Chenopodium.*

To the citations given by Fosberg showing a range limited to central and western Nevada, the following may be added:

Nevada. Nye Co.: Smoky Valley. Maguire and Holmgren 25359, June 1945 (NY., PH.).

It has not been possible from the material at hand adequately to separate the taxa which may be present in the following group of southwestern plants with more or less *Fremontii*-type leaves and reticulate pericarp. The key presented by Aellen and Just is particularly lacking in usefulness at this point since the alternatives " Alveolae of seed surface abutting " and " Canals separating the alveolae of seed surface " remain uninterpretable by the present author, as do also the alternatives " Plants foetid " and " Plants not foetid " when dealing with dried material. Some of the following species (Nos. 31–34) are clear-cut and some are not.

31. *C. Watsoni* A. Nelson. Bot. Gaz. 34: 362. 1902.

This is the clearest and most generally recognized species of its group. Rather suggesting large *C. incanum,* it is characterized by the somewhat whitened reticulate pericarp and by the conspicuously leafy inflorescence. The sepals entirely enclose the thick, globose fruit at maturity. Their connivent, acute tips appear in strong contrast with those species in which the mature fruit is partially exposed.

Aellen, p. 120, cites material from South Dakota, Montana, Colorado, New Mexico and Arizona. The following citation extends its range into another state:

KANSAS. Hamilton Co.: Hitchcock, Aug. 1895 (NY.).

32. **C. glabrescens** (Aellen) *stat. nov.*
C. Watsoni forma *glabrescens* Aellen in Fedde Rept. Sp. nov. 26: 120. 1929.

In the material seen, this species differs constantly from *C. Watsoni* in the pedicellate flowers and more diffuse and less leafy inflorescence. It also has thinner leaves and a more strongly whitened pericarp, is generally larger, and with the basal branches often exceeding the central stem. *C. Watsoni* is freely branched but usually pyramidal in aspect because of the strong central stem.

Aellen recognized it as a forma but it is much more than that. Whether it can continue to be maintained in the specific category is not at present certain, but the characters are of sufficient magnitude and are of the same nature as those that separate species in other cases. Aellen (p. 120) cited only a single collection from Ute Park, Colfax Co., New Mexico (indicated as Mexico—obviously a slip), Standley 13505 (US.). The following additional material is referred here:

NEW MEXICO. Sierra Co.: Animas Creek, near Caballo. Fogg 18893, Aug. 1941 (Penn.). Grant Co.: 8 mi. w. of Silver City. Barkley 14657, Sept. 1944 (Ill.). Fort Bayard. Mulford, 594, Aug. 1895 (Ill., NY.). Sandoval Co.: Guadalupe Canyon. Eggleston 18734, July 1923 (US.). Socorro Co.: Datil. Eggleston 16180, Sept.–Oct. 1919 (US.).

In addition there are two sheets in the University of Illinois Herbarium, of plants grown from seed, one indicated as being " Seed from Utah, 1873. Cult. by E. Hall ", the other " From Powell's Arizona Seeds. E. Hall, 1873 ". These can scarcely be taken to constitute distribution records.

33. *C. neomexicanum* Standley. N. Amer. Fl. vol. 21, p. 19. 1916.
C. lenticulare Aellen. Fedde Rept. Sp. nov. 26: 152. 1929.

Aellen and Just refer *C. neomexicanum* to *C. Watsoni* forma *glabrescens,* from which it, however, differs markedly. *C. lenticulare* as described by Aellen and maintained by Aellen and Just seems to be the same as Standley's *C. neomexicanum.* Its range probably includes w. Texas, New Mexico, and Arizona.

34. *C. Palmeri* Standley. N. Amer. Fl. vol. 21, p. 19. 1916.
C. arizonicum Standley. N. Amer. Fl. vol. 21, p. 19. 1916.

Aellen referred *C. Palmeri* to *C. Berlandieri* ssp. *eu-Berlandieri* and maintained *C. arizonicum* separately, but the types of both species represent the same taxon. That of *C. arizonicum* is a small plant lacking all but some of the inflorescence leaves, while that of *C. Palmeri* is the top of a large plant with the secondary leaves present. Both have the same small *Berlandieri*-like seeds and are representatives of a well-marked taxon with small *Fremontii*-type leaves, the primary ones usually with bi-partite basal lobes; upright habit with basal spreading branches and a strong development of a terminal leafless inflorescence. In the latter character and in seed shape and markings it is closely related to typical *C. Berlandieri* while in habit and in leaf shape and texture it approaches the *C. Fremontii* group.

The following collections are referred here (all US.).

ARIZONA. Pima Co.: Boboquivari Mts. Kearney and Peebles 14966, Aug. 1940. Boboquivari Mts. Peebles 8915, Aug. 1932. Santa Rita Mts. above range. Griffiths 6011, Sept.–Oct. 1903. NEW MEXICO. Agua Zarca, vicinity of Las Vegas. Bro. Arsene 18504, Aug. 1927. TEXAS. Houston. Fisher 277, Sept. 1918. Brownsville. Runyon 287, 1922. Olmito. Rose and Russell 24185, Oct. 1927.

35. *C. Standleyanum* Aellen
C. Boscianum Moq. of authors, not as to type

C. Standleyanum is the widespread uniform eastern species which most nearly resembles, in its thin leaves and fruits maturing successively and largely exposed at maturity, the western *Fremontii-atrovirens* complex. It is readily recognizable by its rounded sepals hardly more than curling well over the margins of the mature fruit (Fig. 10), strongly separable pericarp and delicate branching habit. From the *Fremontii*-type species it differs especially in having the primary leaves variously serrate-margined, although many of the upper ones are entire. The tendency in the western taxa is always toward leaves with a hastate base. This tendency is almost lacking in *Standleyanum* but is observed to a slight extent in the western part of its range. There also, in the region inhabited by *C. album* var. *Stevensii* (Illinois and northwestward), the leaves may be moderately firm in texture.

In the *Fremontii-atrovirens* complex the tendency is toward plants branched near the base, the branches then spreading and producing a pyramidal habit, or, more often in the thin-leaved forms, becoming strongly upright and with a more conic or nearly cylindric habit. This tendency is entirely lacking in the eastern representative, branches being produced more often from the upper half of the plant, so that in both branching and leaf outline it more nearly resembles *C. album*. It is perhaps most closely approached in appearance by the western *C. incognitum* which, as mentioned under that species, constituted the record for it in New Mexico.

Although it is generally known as a woodland plant its habitat is in lightly wooded areas with a decided preference for recently disturbed soil, often on cliffs or banks where the soil is not entirely stationary. In the author's experience it has been of markedly evanescent occurrence, becoming abundant in a single season in recently disturbed shale, sometimes to disappear entirely during subsequent seasons. Under such disturbed conditions it grows luxuriantly and may produce strong plants 5–6 ft. high while in the normal woodland situations it may persist year after year and exhibit its characteristic delicate habit. Its similarity to western species and its habitat preferences suggest it has come into eastern U. S. during relatively recent geologic time as an off-shoot of western (probably southwestern) progenitors. Such widely distributed eastern representatives of genera with numerous western species are commonly recognized.

It is widely distributed from South Dakota and eastern Texas to Southern Quebec (rare) and Florida, probably being most abundant near the middle of its north-south range.

[*C. hybridum* L. Native of Europe. Not known in North America.]

36. *C. gigantospermum* Aellen in Fedde Rept. Sp. nov. 26: 144. 1929.
    C. hybridum var. *gigantospermum* (Aellen) Rouleau in Nat. Canada LXXI. 268. 1944.
    C. hybridum Amer. auth. Incl. *C. gigantospermum* var. *Standleyanum* Aellen, l.c., p. 147.

The characters of the seed coat and of the perianth are sufficiently clear-cut to separate the American material specifically from the European *C. hybridum* L. The difference is not only in seed size as held by Fernald (5),—" Surely *Chenopodium gigantospermum* . . . differs [from *C. hybridum*] only in its larger seeds. It is so like true *hybridum* that acute botanists from Pursh to Standley have detected no difference . . . ." Seeds of European *C. hybridum* are usually 1.5–2.0(2.2) mm. in diameter; Fernald gives the seed size of the American representative as 1.5–2.0 mm. in diameter, with var. *Standleyanum* having seeds 2.0–3.0 mm. More than 100 sheets of American material at hand show a wide distribution, with only one plant (to 2.7 mm.) having seeds more than 2.4 mm. in diameter. The seed size, although of significance in a genus in which 1.0 mm. is small and 2.0 mm. is large, is by no means as impressive as the contrast betwen the thick, black, strongly reticulate, attached pericarp of the European material and the thinner greenish-hyaline, less reticulate, separable to attached pericarp of American material; the lenticulate seed with strongly rounded margin of the former and the umbonate-lenticulate seed tapering from the raised center to the sharply defined margin of the latter; the broad sepals with green center and strongly contrasting hyaline margin covering much more of the fruit in the former (Fig. 12) and the narrow sepals with less contrasting coloration in the latter (Fig. 11); the inflorescence and the leaf base. Actually those acute botanists from Pursh to Standley also missed *C. missouriense* and *C. macrocalycium*, largely misinterpreted *C. Berlandieri*, and consistently referred these and sundry others to *C. album* and *C. lanceolatum!*

Aellen described *C. gigantospermum* var. *Standleyanum* as having seeds to 3.0 mm. broad and with the pericarp not adhering. Such a plant may exist but it has not been seen. In the material at hand the larger-seeded material has the pericarp more firmly attached, while it becomes more separable in the smaller-seeded plants. Specimens annotated by Aellen as var. *Standleyanum* have seeds to 2.4 mm. broad with pericarp relatively thicker and attached. Unless additional evidence for the existence of the variety comes to hand, the entire series, actually fairly variable in seed size and separation of pericarp, may be retained as a unit. The formae described by Aellen exist as such but they represent chiefly age or habitat differences and are not included here.

C. gigantospermum is widely distributed in North America except in the southeastern states and becomes more abundant northward. Its close relationship to *C. hybridum* indicates that the two were derived from a widespread species of relatively northern distribution, probably at a time when a more continuous flora occupied the American-Eurasian area.

37. *C. murale* L.
38. *C. urbicum* L.

These two species are characterized by their relatively broadly deltoid or triangular leaves prominently toothed throughout, by the irregularly reticulate, attached, black pericarp and the short stout stigmas. They seem to be closely related to each other and also to *C. mexicanum,* and to be members of Subsection *Undata.* The inclusion by Aellen and Just of *C. urbicum* in Subsection *Lejosperma,* with smooth-seeded species, and of *C. mexicanum* in Section *Pseudoblitum,* with vertical seeds, is difficult to understand. They are, however, possibly more closely related to vertical-seeded groups than are other species with horizontal seeds.

Both species seem to be relatively urban in habitat in North America, where they occur as introduced plants. They are widely distributed but not common except that *C. murale* may be fairly abundant near the west coast. The leaves of both are moderately thin in texture. Several collections of young material of *C. murale* from Oregon have been seen suggesting the presence of a thicker leaved form in this region.

39. *C. polyspermum* L.

The relationship of this little species is uncertain but there should be no question concerning its recognition,—the apiculate sepals are distinctive, and the small exposed seeds and thin ovate entire leaves with glomerules of flowers in spikes or cymes from the axils of nearly the lowermost to the uppermost, set it clearly apart.

Aellen and Just included it in Subsection *Undata* along with *C. murale,* but the affinity of the latter is surely with *C. urbicum* and *C. mexicanum* which are included under other section and subsection categories. Standley retained it in a separate group of its own, which seems reasonable, though the present author would be inclined to associate it and *C. Vulvaria.* Both Standley and Aellen place *C. Vulvaria* in close relationship with *C. Watsoni* and its relatives (*C. incanum,* etc.), a course which does violence not only to the appearance of the plants but to the fact that the former, along with *C. polyspermum,* is of Old World origin while *C. Watsoni* belongs to the considerable group of plants apparently native in arid and mountainous regions of the western parts of the Americas.

Plants upright, the small cymes in spikes from the primary leaf axils, forming a pyramidal paniculate inflorescence .... var. *acutifolium*

Plants spreading, the very diffuse cymes chiefly from the leaf axils on the primary branches. var. *obtusifolium*

The two varieties of *C. polyspermum* are, in their extremes, strikingly different in appearance. Var. *obtusifolium* Gaudin, spreading or prostrate and with diffuse axillary cymes, has been seen from:

Ballast grounds (along the Delaware River near Philadelphia, Pa., or Camden, N. J.). Brinton, Aug. 1879 (Penn.); and Montreal, Quebec, Hart 11, Aug. 1944 (OTB.).

Var. *acutifolium* (Sm.) Gaudin, the generally upright form with glomerules in axillary and terminal spikes, has been sparingly introduced in the U. S. but is apparently of frequent occurrence along the St. Lawrence river in Quebec and Ontario, Canada.

CANADA: New Brunswick. Charlotte Co.: St. Andrews. Groh, July 31, 1936. Quebec. Nicolet Co.: Nicolet. Frere Allyre 2763, Sept. 1947. Rouville Co.: Rougemont. Lionel Cinq-Mars, Sept. 1948. Chambly. Terrill 6090, Sept. 1949. St. Hyacinthe. Marie-Anselme 19, Sept. 1948. Yamaska. Marie-Victorin, Rolland-Germain and Rouleau 2210, Aug. 1943. Ile Ste.-Therese, Richelieu River. Marie-Victorin and Rolland-Germain 2004, Oct. 1934. Ontario. Ottawa. Groh and Dore, Aug. 10, 1935. Minshall 153, June 1939. Saskatchewan. 6 mi. w. of Wallwort. Breitung 479, Aug. 1939. (Can Field Nat. 54: 58. 1940.) (All OTB.)

U.S.A.: Pennsylvania. On ballast, Philadelphia. Burk (no date but probably in the 1880's) (Penn.).

40. *C. serotinum* L.
C. ficifolium Smith

Of very infrequent occurrence in North America is this distinctive species which is widespread through Eurasia. The leaves are lobed at base, usually 1.5–3.0 cm. wide across the basal lobes, above which the median lobe continues with the sides relatively parallel and usually prominently but remotely serrate nearly to the tip (Fig. 13). The blades taper gradually to the petiole and are quite farinose beneath, causing small, young plants to be mistaken for *C. glaucum*. The length of the blade is usually about 5 times the width above the basal lobes. The perianth parts are united farther above the base than is the case in *C. album* and the small seeds with the pericarp minutely but definitely reticulate are distinctive.

The type of leaf described here, with basal lobes and the median lobe with parallel sides, is of not infrequent occurrence in varieties of both *C. album* and *C. Berlandieri* and will be mentioned under those species. It is developed to its best extreme in *C. serotinum*. The present species, as indicated by its reticulate pericarp, may be distantly related to *C. Berlandieri* and is included in Subsection *Cellulata* by Aellen and Just, but it is more *album*-like in appearance and, having developed in Eurasia, probably has its affinities more nearly with that group.

This taxon has long been known under the name *C. ficifolium* Smith, but Aellen (3) finds that the type of *C. ficifolium* is referable to *C. rubrum* L. It has not previously been reported from North America. The following collections have been seen:

Pennsylvania. Bucks Co.: rubbish-dumps and fills on Turkey Hill. Long 67220, May 1945 (in early anthesis) (PH., Penn.). Philadelphia Co.: Bustleton. Wikoff 408, July 1, 1945 (fully mature) (PH.). Florida. Pensacola. Baker 1579, Apr. 1898 (NY.).

41. *C. opulifolium* Schrad.
C. flabellifolium Standley in N. Am. Fl. 21: 19. 1916. (probably)
C. viride L. in part, of Standley, l.c., p. 21.

Another European plant of the *C. album* group that has been introduced in North America but has not become abundant is *C. opulifolium*, characterized by somewhat thicker leaves with basal lobes often bipartite and the median lobe short, so that the blade is hardly longer than wide. It is much more *album*-like in appearance and less readily separable from it than is *C. serotinum*. There seems to be some variation in the presence or absence of bipartite basal lobes and all of the material with relatively shorter leaves cannot be satisfactorily placed. The sepal characters given in the key are of some help but unfortunately they are not always clearly applicable.

CANADA: ONTARIO. Nos. 1116 and 1117 in Herbarium of the Department of Agriculture at Ottawa "grown from seed of a plant collected in a street of Hamilton". Essex Co.: Sandwich (extreme s.w.). Macoun 54723, July 1901 (NY.).

U.S.A.: PENNSYLVANIA. Philadelphia Co.: Navy Yard. Martindale, Aug. 1865 (PH.). DELAWARE. Wilmington. Commons, June 30, 1900 (PH.). MARYLAND. Cited by Aellen from Cumberland. Steele, 1898 (US.). INDIANA. Allen Co.: Ft. Wayne. Deam 14466, July 1914 (NY.). ILLINOIS. Cited by Aellen and material seen from streets of Rockford, "thoroughly established". Bebb, 1880 (NY.). Mt. Carmel. Schenck, July 1894 (NY.).

Several other collections that probably belong here have been seen from the region of eastern seaports in New York, New Jersey and Pennsylvania, but the material is not in such stages as to afford positive separation from *C. album*.

42. *C. album* L.

Leaves of ordinary texture, chiefly less than twice as long as wide, the teeth prominent but hardly sharp.
  Plants relatively strict in habit; glomerules chiefly contiguous; sepals more often pointed and yellow-margined; flowers all sessile; leaves more broadly ovate and serrate but grading into lanceolate entire bracts; widespread and common .... var. *album*
  Plants with spreading branches; glomerules conspicuously separate; sepals more often obtuse and whitish-margined; individual stalked flowers often present; leaves more narrowly ovate to lanceolate, those of the inflorescence entire; widespread and common. var. *lanceolatum*
Leaves thicker, firm but brittle, not coriaceous, generally twice as long as wide and sharply toothed; plants chiefly robust; seeds in the larger size range; Illinois, northeastward and northwestward .... var. *Stevensii*

And so we come at length, but not last, to *C. album*, the most commonly encountered member of the genus and a favorite of the taxonomic conservative. Abrams (1), admits to reducing "34 subspecies, varieties, and forms in North America" to it, including the numerous variants of *C. Berlandieri*. Gleason (9) goes one step farther and adds *C. Bushianum*. Included also have been *C. missouriense*, *C. macrocalycium* and *C. strictum* var. *glaucophyllum* because they have been unrecognized. The actual limits of the species are extensive enough, geographically, genetically and ecologically. It remains, even after the elimination of the extraneous inclusions, probably one of the most widespread and variable of plant species and the most abundant species of *Chenopodium* in American collections. Aellen's statement that most American material identified as *C. album* actually belongs to *C. Berlandieri* ssp. *Zschackei* is not entirely correct, but his work in distinguishing these and other taxa has served as the first basis for an understanding of much of the American material. It is to be regretted that his critical determinations have not been more widely appreciated.

Of the various sub-species, varieties and forms recognized by him, however, it is deemed advisable, because of the great amount of ecological variability involved, to recognize fewer categories for the North American material. Typical *C. album* (Fig. 4) is characterized by its relatively upright habit; by most of the leaves being of the relatively broader type and more prominently, usually abundantly, toothed; by the more often yellow-margined sepals; relatively non-glomerate (the glomerules contiguous) inflorescence and by its habitat, which is largely restricted to recently disturbed soil.

From this, var. *lanceolatum* (Muhl.) Coss. & Germ. Fl. Paris 451, 1845, (*C. lanceolatum* Muhl.) (Fig. 3) differs in its more spreading habit, narrower and less prominently toothed leaves, usually whitish-margined sepals and by the strongly glomerate inflorescence (the glomerules separate, therefore apparent). These characters occur in such a bewildering series of combinations and intergradations that the variety probably would be dispensed with entirely were it not that the extremes present entirely different aspects in the field and the narrow-leaved, spreading, glomerate type of plant also departs markedly from the upright broader-leaved type in its habitat. Typical *C. album* is a plant of cultivated places, rarely occurring in soil not recently disturbed. Var. *lanceolatum*, while it also grows in recently cultivated soil, will grow and persist in undisturbed soil. It is more characteristically a plant of waste places, often urban, while the common garden and corn-field weed, in the author's experience, is the typical variety. One may not assume that the habit is entirely a response to the habitat since the spreading habit of the variety is recognizable even when the plants are crowded, and the upright habit of typical *C. album* persists in isolated plants. There is, of course, considerable variability within the upright and spreading categories. The habitat difference, more or less obligate in some taxa, is an important feature and one that can be appreciated only from field experience. It will be referred to also under *C. missouriense*.

Aellen, and Aellen and Just have treated var. *lanceolatum* as a forma. Its characters indicate it to be at least of varietal status (the differences are not just ecological) even though no separate geographic range can be assigned to it. Field observations strongly suggest it is genetically isolated from the typical variety, but attempts to separate any considerable amount of material on morphological characters leave many apparent intermediates. As treated here it would include f. *glomerulosum* (Reichenb.) Aellen and f. *cymigerum* (Koch) Aellen, of Aellen and Just's treatment. Relatively more material would be referred to it, including some considered as the typical variety by Aellen, since the sepal characters and the presence of occasional pedicellate flowers are considered of importance. In the considerable amount of material at hand the number of sheets under var.

lanceolatum exceeds those under var. *album*. This may not actually reflect their relative abundance since collectors are more apt to pick up material from waste places than from cultivated fields. It does definitely reflect the fact that a large number of collections by the late B. F. Bush, the indefatigable collector of chenopods, are from " waste places " around Courtney, Independence and Kansas City, Missouri.

The differences between var. *album* and var. *lanceolatum* are paralleled by the differences between typical *C. pratericola* and its var. *oblongifolium*, the variety in each case having a more spreading habit, narrower leaves and with the sepals relatively more blunt and greener.

From Illinois northeastward and northwestward there occur thicker leaved forms, variable in leaf outline but with a definite tendency toward basal lobes and the terminal lobe with parallel sides. Although the leaves are thicker they remain brittle and do not take on the coriaceous texture more common in *C. Berlandieri* and other native western forms. These are considered deserving of varietal recognition as

var. *Stevensii* Aellen, Fedde Rept. Sp. nov. 26: 130. 1929, including in synonymy var. *dacoticum* Aellen, l.c., p. 131, and ssp. *fallax* Aellen, l.c., p. 131.

In this relatively drier region (into the Dakotas and Manitoba) one might expect ecological variants with thicker leaves and reduced size. Plants placed here are, however, usually of large stature and with seeds in the maximum size range for the species, thus indicating genetic rather than ecological variation. It may be a native American development from the *C. album* complex. The taxa here included under var. *Stevensii* have been reported only from North Dakota. The following range-extensions may be noted:

CANADA: QUEBEC. Shefford Co.: Frere Fabius 385 (NY.). Longueuil Co.: DeChambly. Fr. Marie-Victorin and Rolland-Germain 43636 (OTB.). ONTARIO. Ottawa. Minshall, Aug. 9, 1935 (OTB.). MANITOBA. Brandon. Stevens 265 (OTB.).

U.S.A.: ILLINOIS. Champaign Co.: 15 mi. w. of Urbana. Jones 14030 (Ill.). Near Urbana. Jones 12479 (Ill.). MICHIGAN. Keweenaw Co.: West Bluff. Richards 2445 (OTB.). MINNESOTA. Cass Co.: Lake Winnibigoshish Dam. Stevens 70 (OTB.).

Var. *microphyllum* Boenningh. This may be a good enough variety, since the leaves not only are smaller but the upper ones and bracts continue to be more serrate than in other forms. It is difficult to separate because the older, larger, leaves are not always present in collected material. The variety is not included in the key because of its tenuous status. The following may be referred here in addition to the Washington, D. C., collection cited by Aellen:

FLORIDA. Western shore of Lake Okeechobee. Small 9182, May 1917 (NY.). MISSOURI. Courtney. Bush 8052, July 1917 (Ill.). More than one Bush sheet is numbered 8052 but only one is referred here.

Thin-leaved forms of *C. album* are present in some of the northwestern States—North Dakota to Oregon, and in s. Canada—and these often have the flowers in pronounced flat-topped clusters. The relationships here are not clear but this material probably grades into *C. ferulatum* Lunell which is included by Aellen and Just in *C. Berlandieri* ssp. *Ludwigianum* Aellen. The latter category is used to include the relatively strict, generally northern forms related to *C. Berlandieri* var. *Zschackei*, but *C. ferulatum* is essentially a thin-leaved variation in the *album* series and is not related to *Berlandieri.* More study of this material is needed before the proper category or categories for it may be decided.

43. *C. missouriense* Aellen in Bot. Notiser, Lund, 1928, p. 206.
C. missouriense var. *Bushianum* Aellen in Fedde Rept. Sp. nov. **26**: 156. 1929.

Described from material from Missouri and Tennessee, this very characteristic and uniform species is common and widely distributed in eastern North America south of New England and the Great Lakes.

This taxon has been generally included with either *C. album* or *C. Berlandieri,* both of which it resembles in general appearance and leaf form. Although it may be separated from either by its smaller seeds (Fig. 5), the most useful field character is its unfailing habit of coming into anthesis about the second week in September, regardless of how early or late the particular plant began growth. Once this behavior is recognized it becomes very easy to distinguish the species in the field at any time of the year. *C. album,* with which it might be confused in general appearance (*C. Berlandieri* is almost entirely absent from the eastern states), flowers any time after the plants have been growing from 4 to 8 weeks, so they may be met with in fruit from early July until October. Even those plants of *C. album* which grow from late germinating seeds and which are in the flowering stage at the same time as *C. missouriense* are readily distinguishable in the field by the stiffer habit of the inflorescence in both flower and fruit as well as by their more glomerate arrangement. The inflorescence of *C. missouriense* is relatively flexuous and arching (Fig. 5). Plants of it that start from seed late in the summer flower at the same time as the earlier well grown plants and, especially if partially shaded, develop a slender, delicate inflorescence with the flowers more glomerulate (Fig. 6). It is such forms of this species, along with other similar growth forms (and including true southern *C. Berlandieri* and var. *Boscianum*), that have been treated as *C. Berlandieri* by American authors.

It is separated in the 8th edition of Gray's Manual (as *C. Berlandieri*) partly on the basis of being ill-scented. Although the author has collected it on many occasions in all stages of growth and for a few years kept a colony growing at the side of the house, where it constantly had to be weeded out to allow room for what are considered, by some, to be more desirable cultigens, he has never noticed any difference in odor between this and *C. album.*

Fig. 3. *Chenopodium album* var. *lanceolatum: a,* lower leaf; *b,* branch of inflorescence.

Fig. 4. *Chenopodium album* var. *album: a,* lower leaf; *b,* terminal portion of plant; *c,* fruit and calyx.

Fig. 5. *Chenopodium missouriense: a,* fruit and calyx; *b,* branch of inflorescence; *c,* lower leaf.

Fig. 6. Late growth phase of *Chenopodium missouriense:* branch of inflorescence and lower leaf.

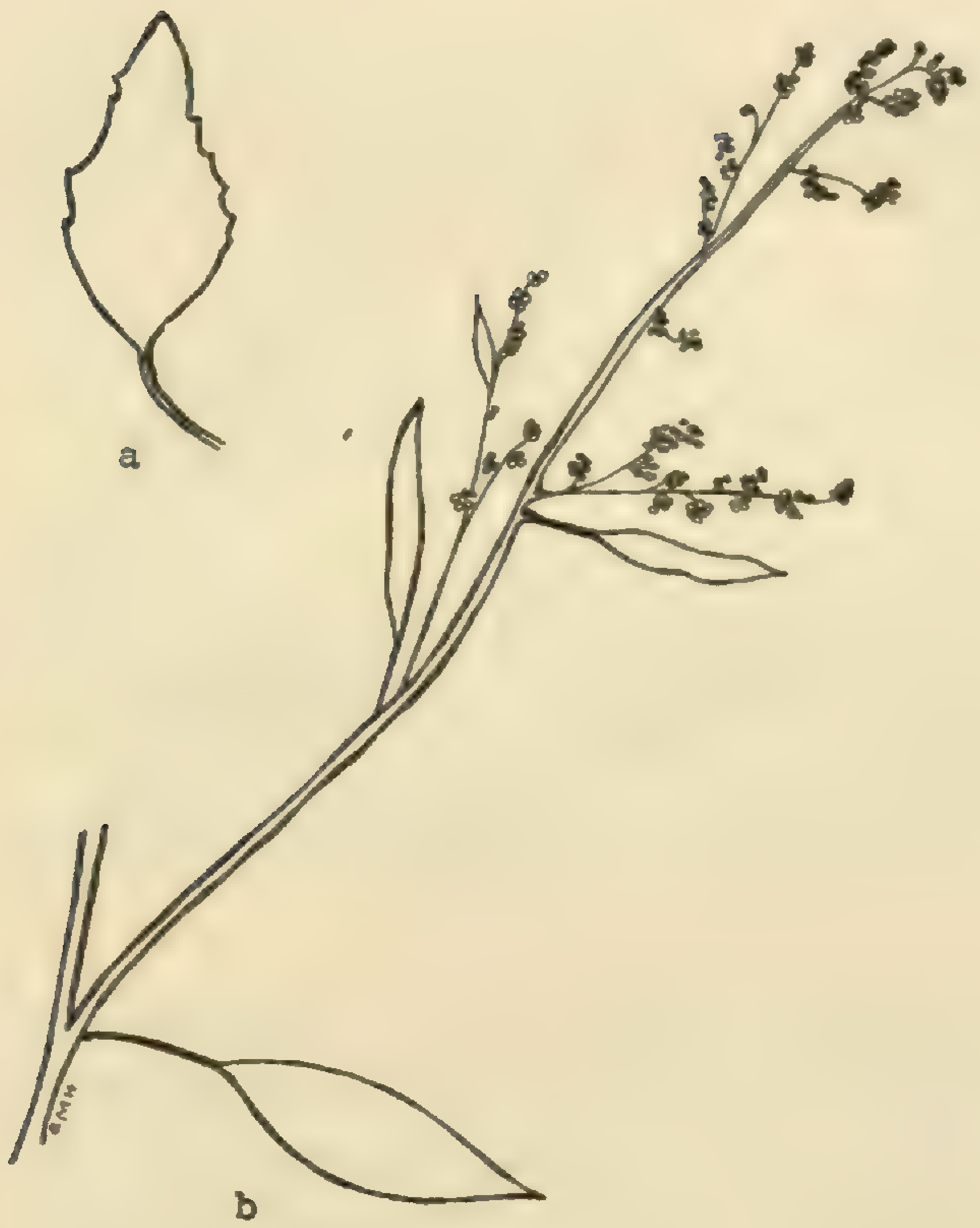


Fig. 3.

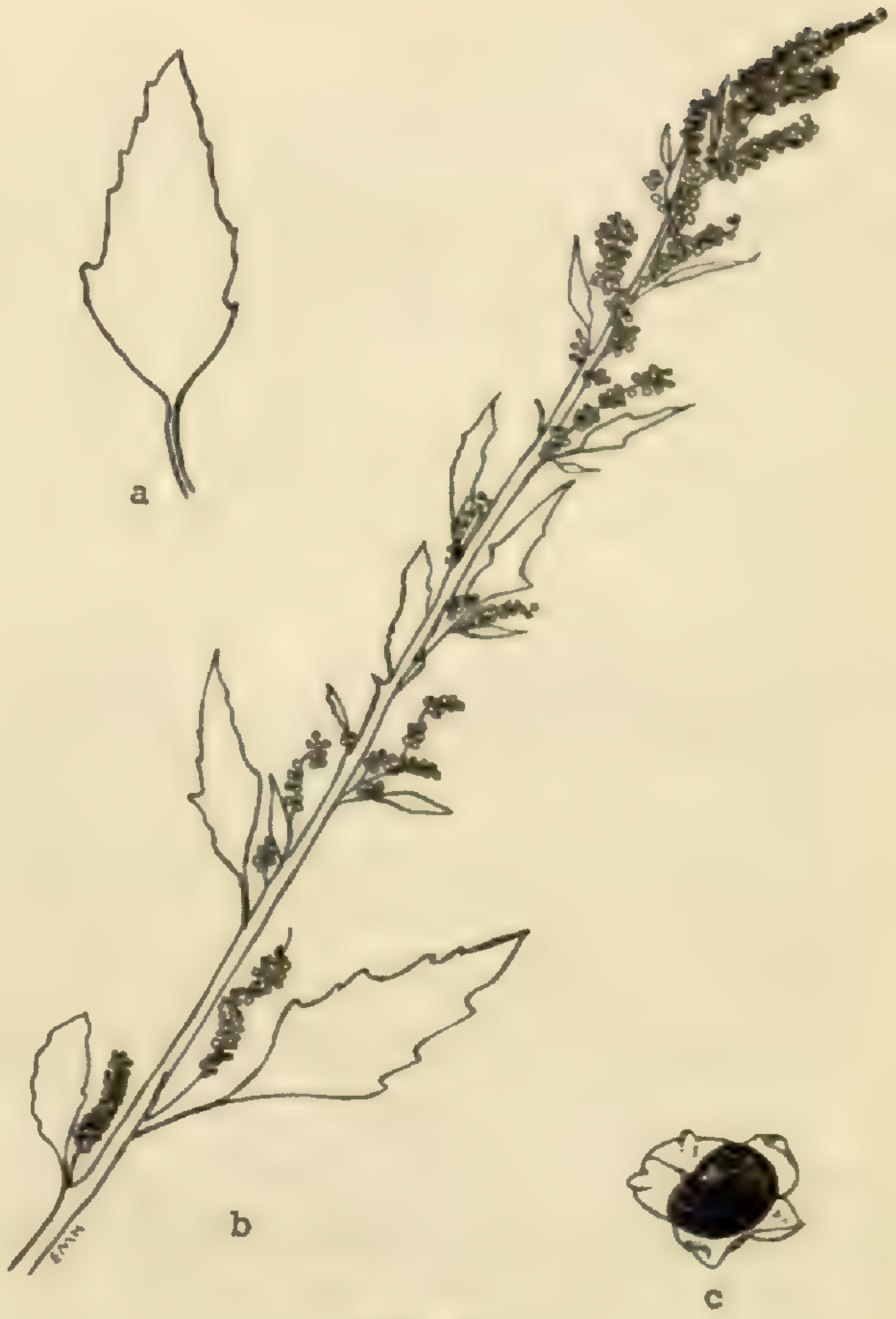


Fig. 4.

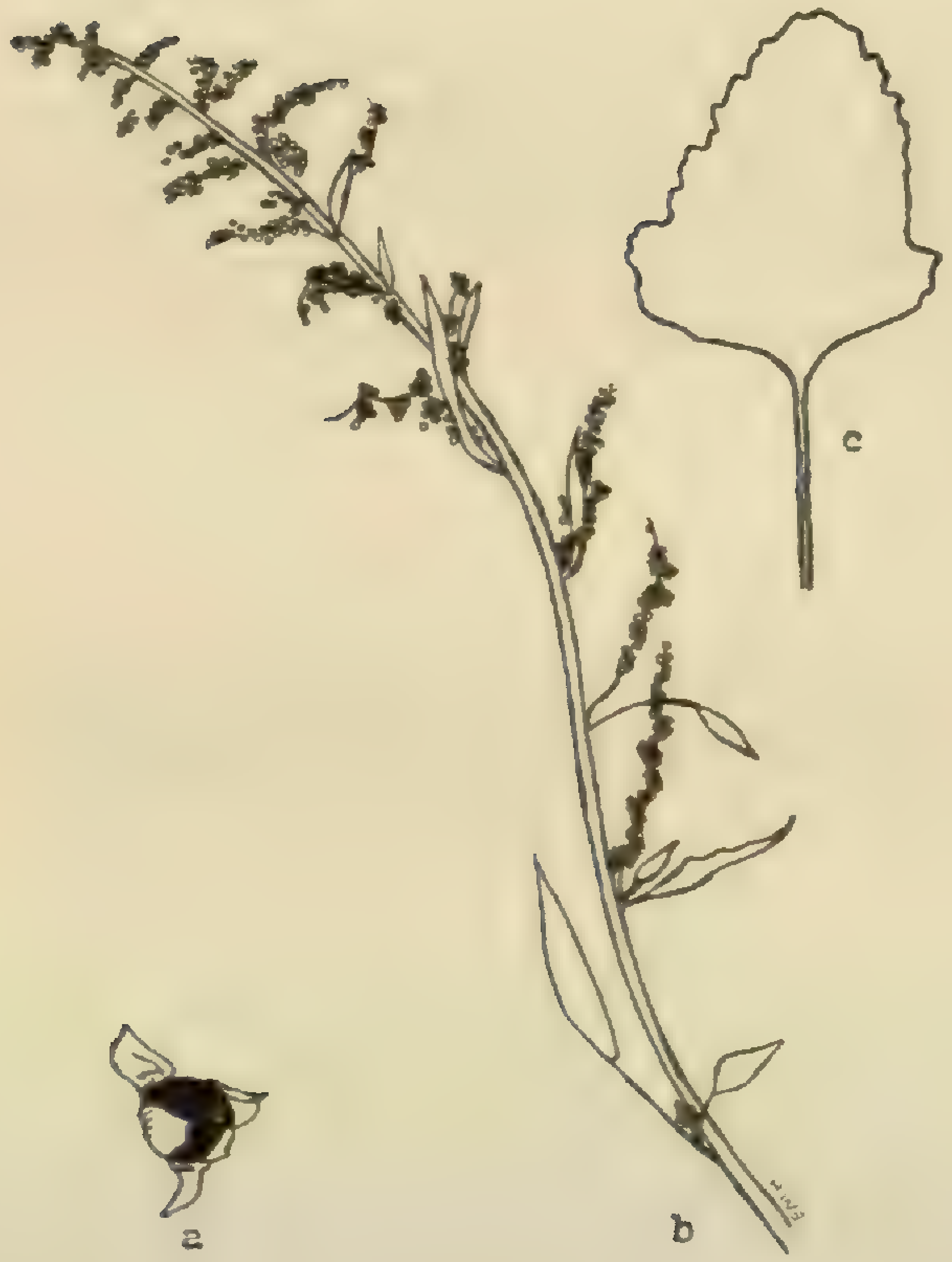


Fig. 5.

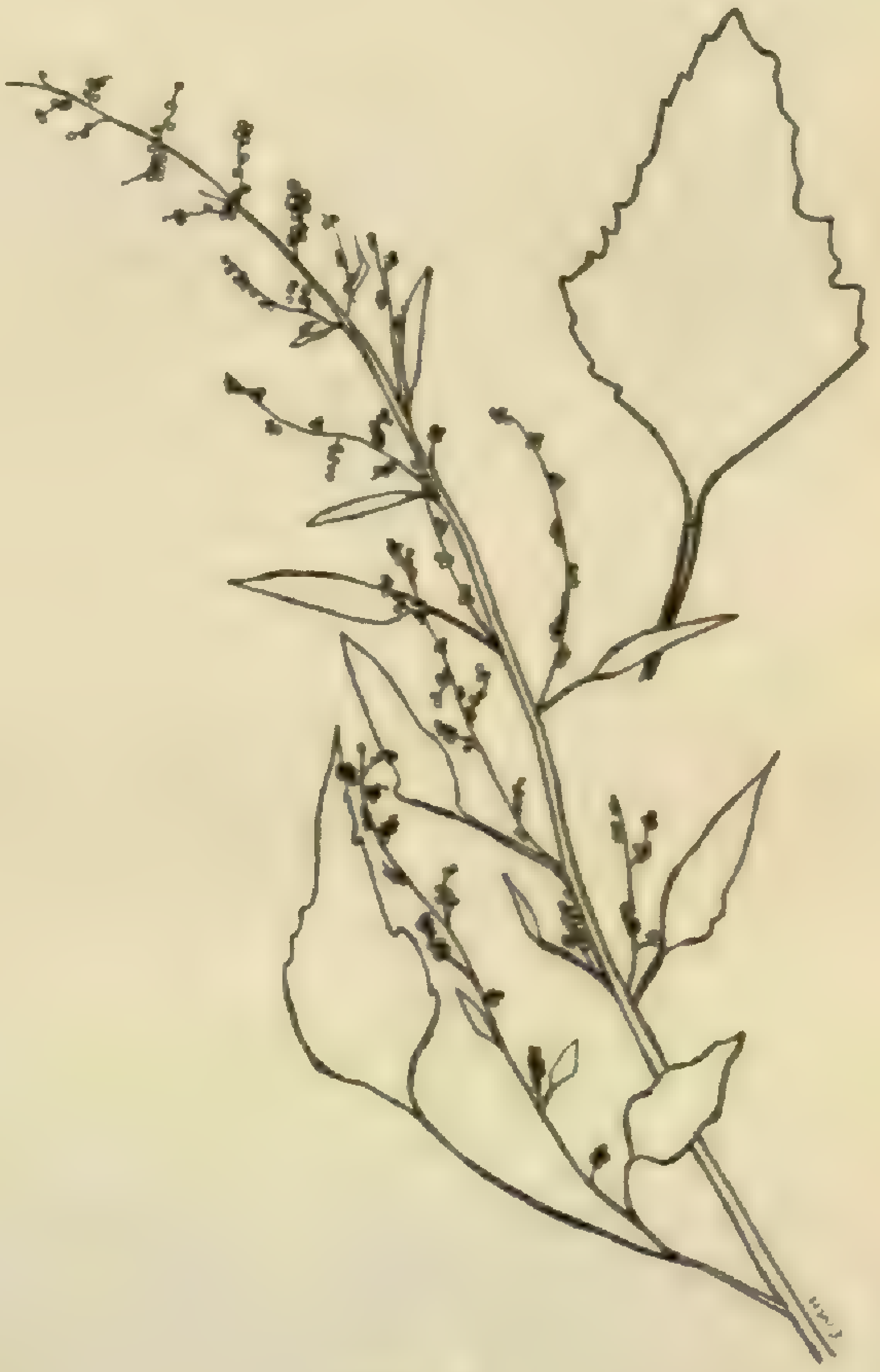


Fig. 6.

Other differences do exist, however. In *C. missouriense* the leaves are more coarsely toothed, the inflorescence branches arching, the seedling leaves are much more obtuse (Fig. 5) (later ones are not), the seeds smaller and, while *C. album* is a plant of cultivated places, rarely growing in soil not disturbed during the current season, *C. missouriense* comes up year after year on roadsides, along streets and alleys, in vacant lots, and very characteristically in undisturbed soil around farm buildings. Finally eliminated from the flower bed, it is now luxuriating in the writer's trampled-down dog-yard, enjoying the high nitrogen and lack of competition where *C. album* var. *lanceolatum* would hardly survive and where var. *album*, if it did get a start in loosened soil, might persist weakly for a season but would fail utterly in establishing succession. It shows progressive variation in habitat from south to north in Pennsylvania. In the southern part, except at higher altitudes, it is generally abundant, growing in various waste places and cultivated fields. Northward it becomes more and more restricted to waste places in towns and around farm buildings. To establish its northernmost limits, one must search for it in the most protected urban areas.

Its relative rarity northward and general absence north of about the southern border of Connecticut is attributed to the probability that its late-flowering habit does not allow time for maturing of the seeds during the period from mid-September to the time of killing frosts. Further evidence of its dependence on length of season is furnished by its presence in waste places near the shore of Lake Erie in Pennsylvania. This narrow strip bordering the lake has a longer frost-free period than areas to the south of it.

Although the material has been under observation for more than 10 years, the application of the name to it was not readily made, since it was separated from *C. album* in the keys (4) (10) by the leaves not being farinose and by the pericarp not being firmly attached to the seed. In neither of these respects is this species appreciably different from *C. album*. Aellen's original description of *C. missouriense* indicated it to be a glabrescent (not farinose) plant, and later a farinose var. *Bushianum* was described. The sheets on which these names were based have been seen at the National Herbarium and all of them are plants that are farinose and to the same varying degree as *C. album*.

Material is not at hand to indicate the limits of its distribution but the following citations may be of value: New York. Bronx Co.: Pelham Bay Parkway. Moldenke 20563 (NY.) and 20567 (NY., OTB.), Oct. 1949. New Jersey. Bergen Co.: Between Moresemere and Palisade. Moldenke 8299, Sept. 26, 1934 (in flower) (NY., Ill.). Burlington Co.: Lindenwold. Mackenzie 8232, Oct. 1917 (NY.). Pennsylvania. Numerous collections need not be cited. Wahl 1423, 1453, 1510 have been distributed. Indiana. Howard Co.: fallow lot. Ek, Oct. 11, 1940. Illinois. Cass Co.: Friesner 10112 (Ill.). Piatt Co.: Jones 19356 (Ill.). Clay Co.: Ahles 5160A (Ill.). Champaign Co.: Jones 10732, 14922, 14954, 17670 (Ill.), 13281 (Ill., NY.). Tazewell Co.: Chase 3516, Oct. 1920 (Ill.). Jefferson Co.: Ahles 5467 (Ill.). Missouri. Numerous collections by B. F. Bush from Courtney, Kansas City, Webb City, Sheffield, bearing, in addition to those cited by Aellen, over 40 numbers.

44. *C. strictum* Roth var. **glaucophyllum** (Aellen) *stat. nov.*

C. glaucophyllum Aellen in Fedde Rept. Sp. nov. 26: 155. 1929.

C. strictum ssp. *glaucophyllum* (Aellen) Aellen and Just in Amer. Midl. Nat. 30: 67. 1943.

The Asiatic *C. strictum* may be recognized by its prominently serrate, oblong-ovate leaves 3 or more times as long as wide. American material referable to this species has the lower leaves only about twice as long as wide, the margins abundantly but shallowly serrate, the median becoming oblong and entire, the upper lanceolate and entire (Fig. 7). Some exceptions in length of leaf occur and the plants present a markedly different appearance from base to tip, but most of our material seems varietally separable from the Asiatic.

The plants respond markedly to habitat and may be 3–5 dm. tall and then often with only a few upwardly curved basal branches or they may be 2 m. tall and with the profuse branching habit of *C. album*, etc. Not having seen the plants in the field, it is difficult to formulate a relatively exact idea of their habit but they seem characteristically to produce a few basal branches which project horizontally 1.0–1.5 dm. and then turn sharply upward, a habit also characteristic of various western species of the *Fremontii* group. In the present species, however, this habit seems not always to be expressed and the central stem may proliferate extensively and produce lanceolate leaves unlike the oblong-ovate basal ones. There is a distinct possibility that more than one taxon is being included. Canadian and other northern collections are characteristic as are also others as far south as Missouri; however, collections from Illinois, some from Missouri and especially some from Arkansas are referred here only tentatively. It is hardly to be considered a native plant, and the northern material is clearly adventive, yet in its southern extension it is not behaving as other introduced chenopods. Axillary inflorescences are usually spicate and stiff (Fig. 7) but terminally they become paniculate and variously spreading, though hardly ever assuming the gracefully nodding habit of *C. missouriense*. In shade it simulates the shade form of *missouriense*.

The bulk of the material is readily determinable by the shallowly serrate oblong lower leaves and small seeds but collections including only upper branches of large plants in flower or fruit at the same time as *missouriense* may not always be certainly named. Most collections are from the Mississippi basin, New England and s. Canada, but there are a few others. The following have been seen:

CANADA: MANITOBA. Winnipeg. Dudley 83, Sept. 1938; 81, July 30, 1939. Denike 763, Aug. 1, 1939; 1855, Aug. 1944. Groh 3223, Sept. 1946. (All OTB.) QUEBEC. Ottawa West. Groh 1571 and 1572, Sept. 1, 1941. Gatineau Park. Groh 1629. Senn and Zinck 874, Sept. 1941. Vaudreuil Co.: Rigaud. Fr. Edmond Roy 3973, Aug. 1935. (All OTB.) The Canada sheets are all very characteristic.

U.S.A.: MAINE. Sagadahoc Co.: Topsham. Furbish, Aug. 29, 1912 (NEBC.). Canton. Growing densely in railroad yard. Parlin 2702, Aug. 11, 1908 (GH.). York Co.: North Berwick. Parlin, Sept. 30, 1896 (GH.). NEW HAMPSHIRE. Wilton. Batchelder, Sept. 12, 1918 (NEBC.). VERMONT. Westminster. Blanchard, Sept. 24, 1901 (GH). MASSACHUSETTS. Essex Co.: Haverhill. Harris 728, Sept. 24, 1932 (*pars.*) (NEBC.). Middlesex Co.: Ayer. Ordway and Bullard, Sept. 15, 1933 (NEBC.). Cambridge. Collins, 3780, Sept. 26, 1916 (NEBC.). Kidder, July 31, 1918 (GH.). Spontaneous Flora of Arnold Arboretum. Palmer 46550, Sept. 1942 (PH., GH.). Suffolk Co.: Back Bay, Boston. Williams, Sept. 17, 1910 (US.). Norfolk Co.: West Quincy. Kidder, Aug. 14, 1898 (NEBC.). Worcester Co.: Woodward, Sept. 28, 1914 (NEBC.). Hampden Co.: Springfield. Andrews 7, Sept. 21, 1911; 18, Sept. 5, 1905; 21, Sept. 21, 1911 (GH.). RHODE ISLAND. Washington Co.: Westerly. Bissell, Harger and Weatherby, Aug. 21, 1913 (NEBC.). CONNECTICUT. Hartford Co.: Hartford. Bissell, Sept. 6, 1903 (GH., NEBC.). Farmington. Andrews 19, Sept. 12, 1907 (NEBC.). Middlesex Co.: Middletown. Blewett, Aug. 18, 1915 (NEBC.). New Haven Co.: Waterbury. Blewett 429, Aug. 30, 1910. NEW YORK. About the Yonkers Wool Mill. Bicknell, July 1, 1894 (NY.).

PENNSYLVANIA. Bucks Co.: Bristol. Fretz, Aug. 1, 1899. Northampton Co.: Slateford. Schaeffer 25303, Sept. 11, 1946. Lehigh Co.: Allentown. Pretz 11553, Sept. 17, 1922. (All PH.) MICHIGAN. Kalamazoo Co.: Vicksburg. Rapp 3719, Aug. 6, 1940, and 3571, Sept. 1, 1940 (suggesting var. *strictum*) (both NY.). ILLINOIS. Vermilion Co.: Jones 14993, Oct. 1941 (Ill., NY.). Lake Co.: Zion. Brown, Sept. 7, 1949 (Ill.). MINNESOTA. Ramsey Co.: St. Paul. Rosendahl, Sept. 1949 (OTB.). IOWA. Iowa Co.: West of Amana. Easterly 948, Aug. 1950 (OTB.). MISSOURI. Aellen cited 46 collections by Bush from Sheffield, Courtney and Webb City. The following have been seen in addition: 8065, 8065A, 8095, 8108, 8108A, 8110, 8111, 8195, 8196, 8844, 11865 (all Ill.), 8195A (PH.), 8546B (NY.). NORTH DAKOTA. Cass Co.: Fargo. Stevens 9, Sept. 1917 (US.). Stevens, Sept. 11, 1932 (PH.). Stevens, Sept. 3, 1950 (OTB.). Muenscher 11756, Sept. 1937 (NY.). Walsh Co.: Park River. Stevens 77, Sept. 1936 (OTB.). SOUTH DAKOTA. Northville. Brenkle, Sept. 30, 1937 (Penn.). Mellette. Brenkle 40-49, Sept. 6, 1940 (GH.). NEBRASKA. Valentine. Bates, Sept. 1, 1900 (GH.). WASHINGTON. Klickitat Co.: Near Bingen. Suksdorf 11536, Sept. 1923 (NY., PH., US.) (leaves longer, depauperate growth form). CALIFORNIA. Stanislaus Co.: Turlock. Howell 15380, Oct. 1939 (US.). Monterey Co.: Chualar. Reed 2064, Aug. 1949 (PAC.). San Joaquin Co.: Sims Station. Keck 1315 (NY.).

Collections referred here tentatively are: MISSOURI. Bush 7063, 7063A and 7063B from Courtney, Aug. 26, 1913 (NY.) (which were named as *C. album* f. *lanceolatum* by Aellen). Bush 8223 and 11641–11645, Sept. 22, 1928 (US.); 11698–11701, Sept. 29, 1929 (NY.). ARKANSAS. Garland Co.: Hot Springs. Demaree 15802, Aug. 1937. Jefferson Co.: Pine Bluff. Demaree 16248A, Sept. 1938. Randolph Co.: Pocahontas. Demaree 23694, Aug. 1942. Yell Co.: Dardanelle. Demaree 20026, Aug. 1939. (All NY.)

45. *C. giganteum* Don, Prodr. Pl. Nepal. 75. 1825.

C. amaranticolor Coste and Reynier, Bull. Soc. Bot. France 54: 178. 1907.

There is no certainty in the author's mind as to the identity of the taxon indicated here. The names used above are given by Aellen and Just but the U. S. records questioned.

In Florida and Georgia there occur very large plants (to 3 m. according to Small, Manual of the Southeastern Flora, 1933, p. 465) with large, sharply doubly-serrate leaves, heavily farinose when young and then often presenting a dull red appearance. Pre-flowering material seen indicates the plants are photoperiodic, flowering in September, and is almost but not quite matched by robust *C. missouriense* and essentially matched by some *C. Bushianum.* If Richards 3827 from waste ground, Athens, Georgia, Nov. 2, 1927 (Penn.) represents the same taxon in fruit, however, then it is neither of these.

Nothing more can be done with the material at hand. It fairly well matches European material called *C. amaranticolor.* Observation of it with reference to photoperiodic response may be rewarding.

46. *C. Berlandieri* Moq.

The most abundant and widespread species of *Chenopodium* in western North America, at least in the plains region and possibly excepting the *pratericola* group, *C. Berlandieri* has, until the work of Aellen, generally gone unrecognized in whole or in part. In general aspect and in size and shape of fruit it resembles *C. album* but is sharply set off from that by the prominently reticulate pericarp (Fig. 9). When fruit is not present the characters of usually thicker leaves, broadly keeled sepals, and the definite style base serve to distinguish it, even though the first two characters are somewhat variable and the third is a bit difficult to apply. Almost always, even in only partially mature fruit, the pericarp shows a yellow area around the base of the style and there is a much more noticeable progression of flowering from tip to base of the plants than in *C. album.*

Associating it in any way with *C. album* does violence to phylogeny. There can hardly exist a reasonable doubt, after a study of the material, that the *C. Berlandieri* complex has come up from the south, in a manner comparable to that recently so competently elaborated for the *Prunus serotina* phylad by McVaugh (11), while *C. album* is of Old World origin.

Disregarding the primary origin of the group, the reticulate-seeded chenopods constitute an assemblage of related taxa in which speciation has taken place in the relatively arid and montane areas of Central America and western North and South America. A postulate of the origin and ramifications of the *Berlandieri* complex in North America is readily arrived at from representative series of collections, with the works of Aellen, and Aellen and Just, as a background.

In the region of eastern Texas and northeastern Mexico are the relatively small-seeded (1.0–1.3 mm.) and small-leaved (2.0–3.0 cm. long) forms with a terminal bractless proliferation of the inflorescence, included by the cited authors in ssp. *yucatanum* Aellen and ssp. *eu-Berlandieri* Aellen. Progressing eastward through eastern Texas and the other Gulf states to Florida, the northward limits undetermined but surely not extensive, is ssp. *Boscianum* (Moq.) Aellen, with the same small seeds, more sharply serrate small leaves (Aellen and Just say 0.5 cm. wide, but the primary ones, though usually much smaller, are up to 2.5 cm. wide and occasionally 4.0 cm. long) and a well defined delicate, terminal, bractless inflorescence. This branch of the phylad presumably includes the progenitors of *C. macrocalycium* of the northern coastal plain.

Westward from the original plexus through the southwestern states and northern Mexico to southern California the tendency is toward plants with leaves becoming progressively larger, thicker, and with the terminal lobe of the leaves with parallel sides, a tendency previously noted in other species. This constitutes ssp. *pseudo-petiolare* Aellen, which reaches an extreme of its development on the west coast, and especially on some of the islands (Clokey 4817 from Santa Barbara) off the s.w. coast. (Aellen also provides var. *californicum* under ssp. *Zschackei*, with similar characters.)

Back again to the Mexico-Texas-Gulf area, this time moving northward and out onto the Great Plains, we follow the most extensive development of the complex, breaking with considerable abruptness, strongly suggesting specific segregation, from its postulated progenitors. The plants in this series are characterized by having generally larger seeds, strongly keeled sepals, usually thicker leaves, a more leafy inflorescence and a general aspect which has been understandably responsible for their inclusion under *C. album*. A large majority of these plants are included in var. *Zschackei* (Murr.) Murr. (ssp. *Zschackei* (Murr.) Zobel, of Aellen and Just's treatment), ranging from Texas, Arkansas, Missouri and Illinois, north to James Bay and the Mackenzie Basin, west to the coast, in a prolific and intricate series of variations, with names available for many.

Concerning *C. Berlandieri* as a whole we are content at present to suggest the following provisional and conservative treatment:

1. var. *Berlandieri.* Including *C. Berlandieri* ssp. *yucatanum* Aellen and ssp. *eu-Berlandieri* Aellen. Leaves membranaceous, 2.0–3.0 cm. long, more or less trilobed, the basal lobe often bipartite; seeds 1.0–1.3 mm. in diam.; inflorescence largely terminal and leafless. Texas and Mexico.

2. var. **sinuatum** Murr. *comb. nov.* *C. petiolare* Kunth var. *sinuatum* Murr. in Bull. Herb. Boiss., 2. ser., t. IV, p. 994. 1904. *C. Berlandieri* ssp. *pseudo-petiolare* Aellen in Fedde Rept. Sp. nov. 26: 60. 1929. Leaves firm, with basal lobes, the terminal lobe elongate, toothed, the margins parallel to near the tip; seeds 1.0–1.3 mm. in diam.; inflorescence somewhat leafy. S.w. U. S. and Mexico.

3. var. **Boscianum** (Moq.) *comb. nov.* *C. Boscianum* Moq. in Chenop. enum. 21. 1940, in part. *C. Berlandieri* ssp. *Boscianum* (Moq.) Aellen in Fedde Rept. Sp. nov. 26: 61. 1929. Leaves membranaceous, 2.0–4.0 cm. long, rhombic-triangular, not prominently trilobed, conspicuously dentate or the upper becoming entire, especially abundant on the branches; upper portions of the inflorescence more delicate and becoming bractless; seeds 1.0–1.3 mm. in diam. East Texas to Florida.

4. var. *Zschackei* (Murr.) Murr. in Festschrift Aschers. 70. Geburtst., p. 227. 1904. *C. Zschackei* Murr. in Deut. bot. Monatschr. XIX: p. 39. 1901. *C. Berlandieri* Moq. ssp. *Zschackei* (Murr.) Zobel in Verz. Anhalt Phanerog. III, p. 70. 1909. Leaves thin to coriaceous, variable in size and shape but larger than other varieties; sepals usually strongly keeled; seeds 1.2–1.5 mm. in diameter; inflorescence leafy. Central and western U. S. and Canada, e. to Ont., Ill., Ark. and Tex. Also two collections seen from s.e. Pa. and one from s.w. Va.

As here considered, var. *Zschackei* is a variable taxon and includes the following named varieties and subspecies of Aellen and Just's treatment:

var. *foetens* (Ludwig) Aellen, smaller leaved, more farinose plants possibly grading into var. *farinosum;*

var. *farinosum* (Ludwig) Aellen, *C. dacoticum* Standley, and possibly better in the specific category;

var. *californicum* Aellen, similar to and perhaps better included with var. *sinuatum;*

ssp. *Esauae* Aellen, with often entire leaves and glomerate inflorescence (simulating *C. album* var. *lanceolatum*);

Fig. 7. *Chenopodium strictum* var. *glaucophyllum: a,* lower leaf; *b,* branch of inflorescence; *c,* fruit and calyx.

Fig. 8. *Chenopodium macrocalycium: a,* lower leaf; *b,* plant; *c,* fruit and calyx.

Fig. 9. *Chenopodium Berlandieri* var. *Zschackei:* fruit and calyx.

Fig. 10. *Chenopodium Standleyanum:* portion of branch of inflorescence with young and mature fruit.

Fig. 11. *Chenopodium gigantospermum:* fruit and calyx.

Fig. 12. *Chenopodium hybridum:* fruit and calyx.

Fig. 13. *Chenopodium serotinum:* lower leaf.

Fig. 14. *Chenopodium Fremontii:* lower leaf.

Fig. 15. *Chenopodium Bushianum: a,* lower leaf; *b,* fruit and part of calyx; *c,* branch of inflorescence.

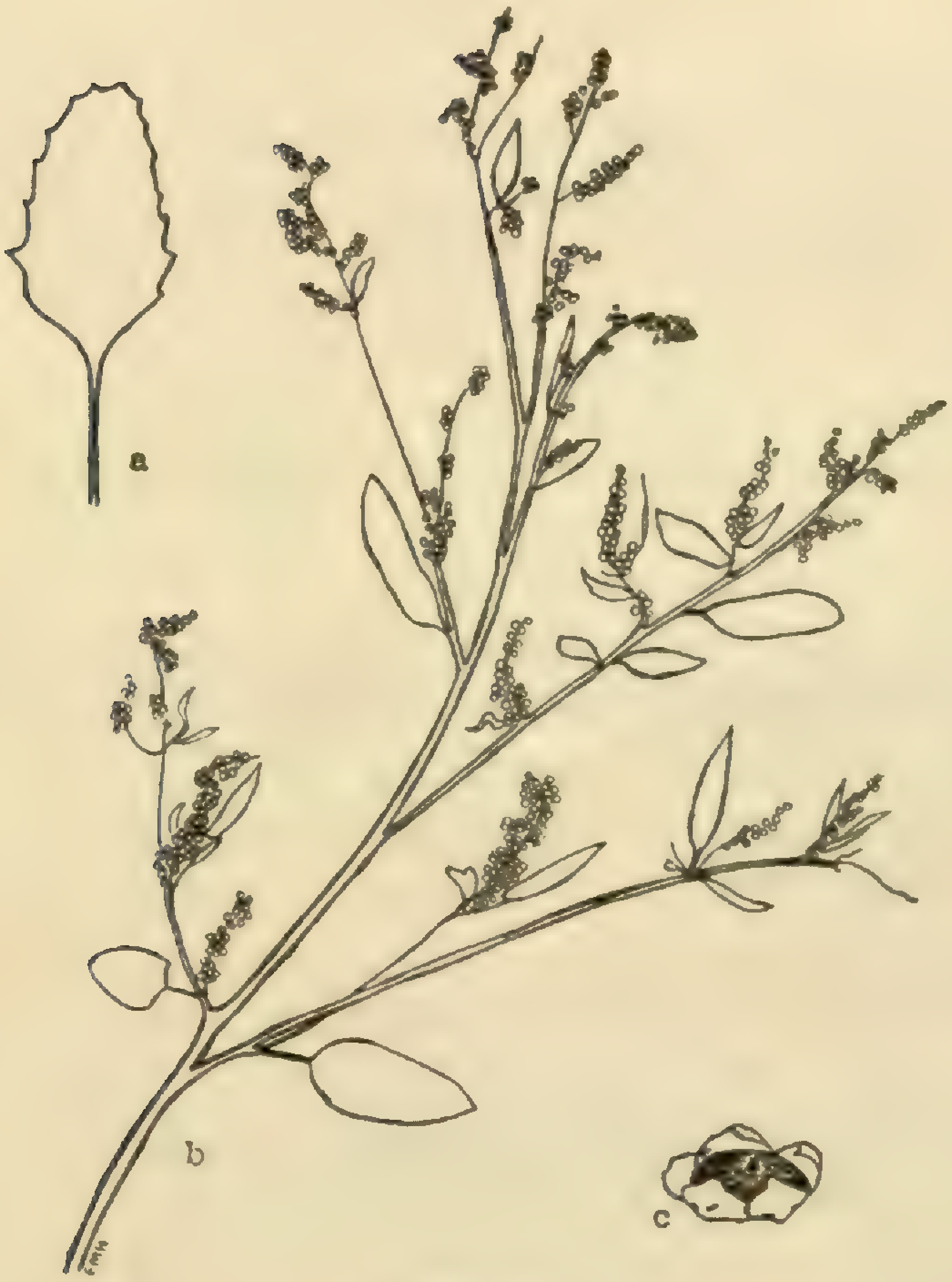


Fig. 7.

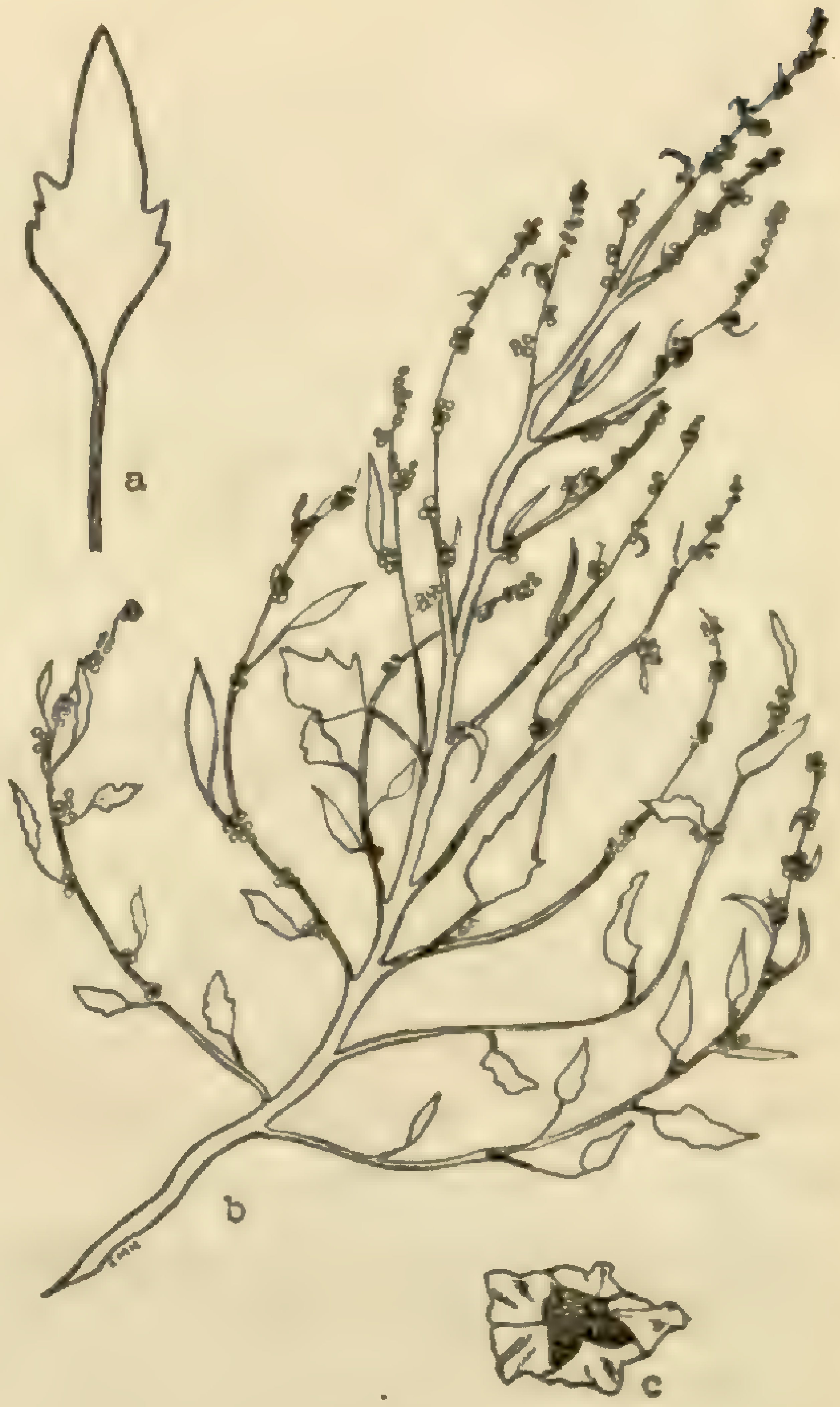


Fig. 8.

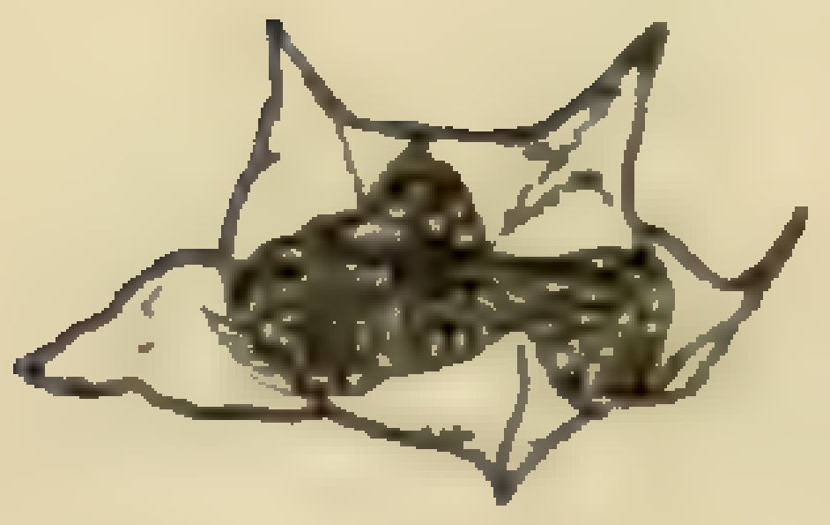


Fig. 9.

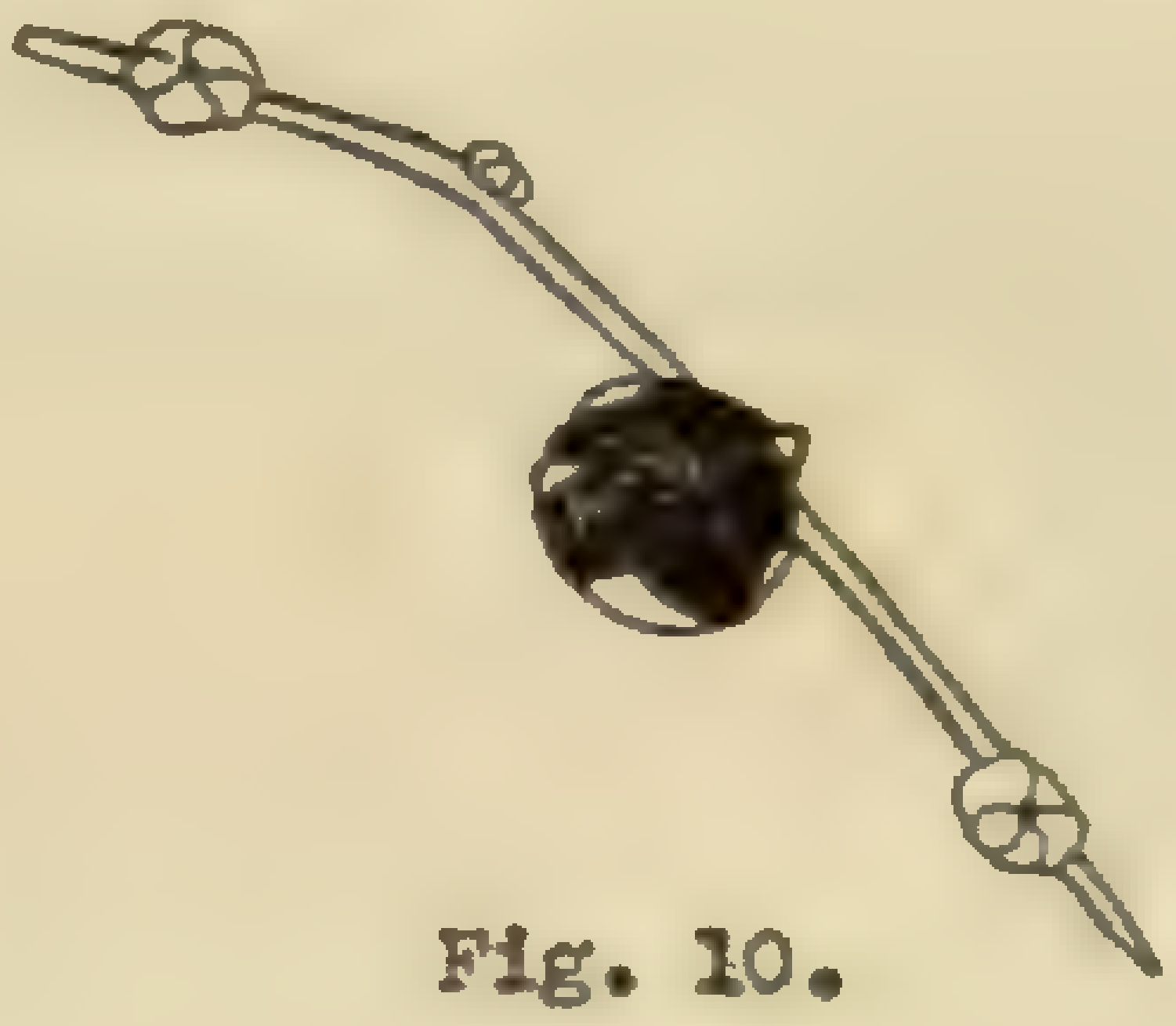


Fig. 10.

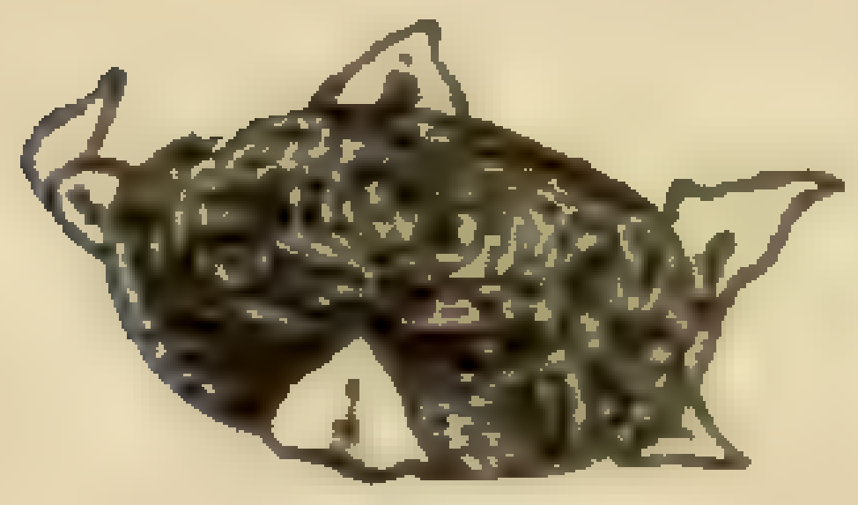


Fig. 11.

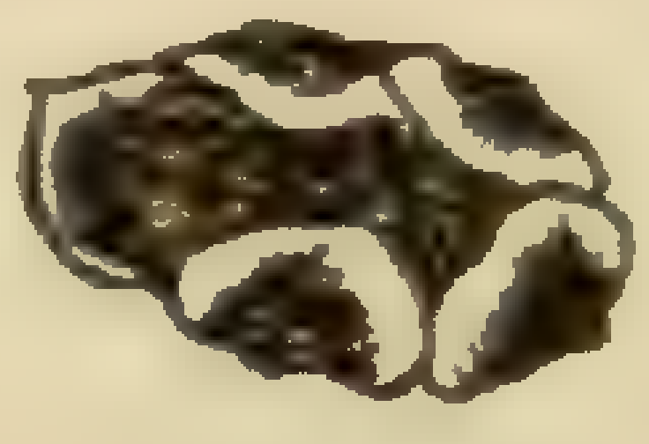


Fig. 12.

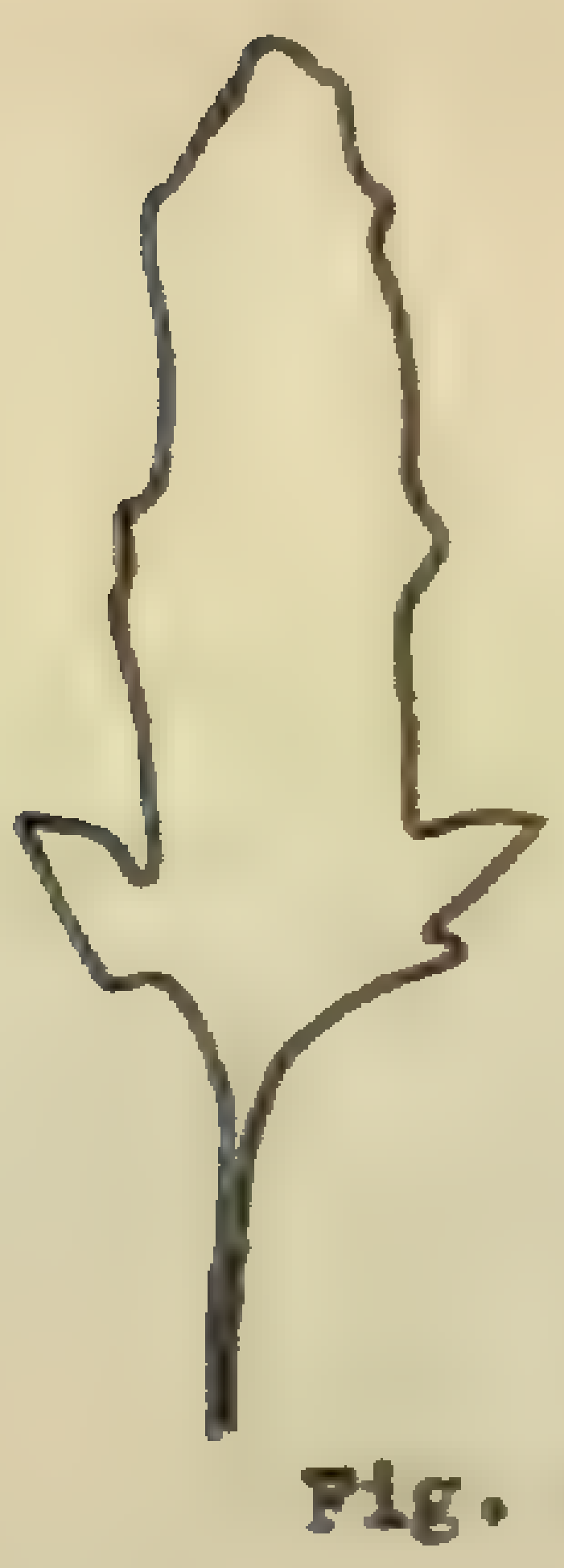


Fig. 13.

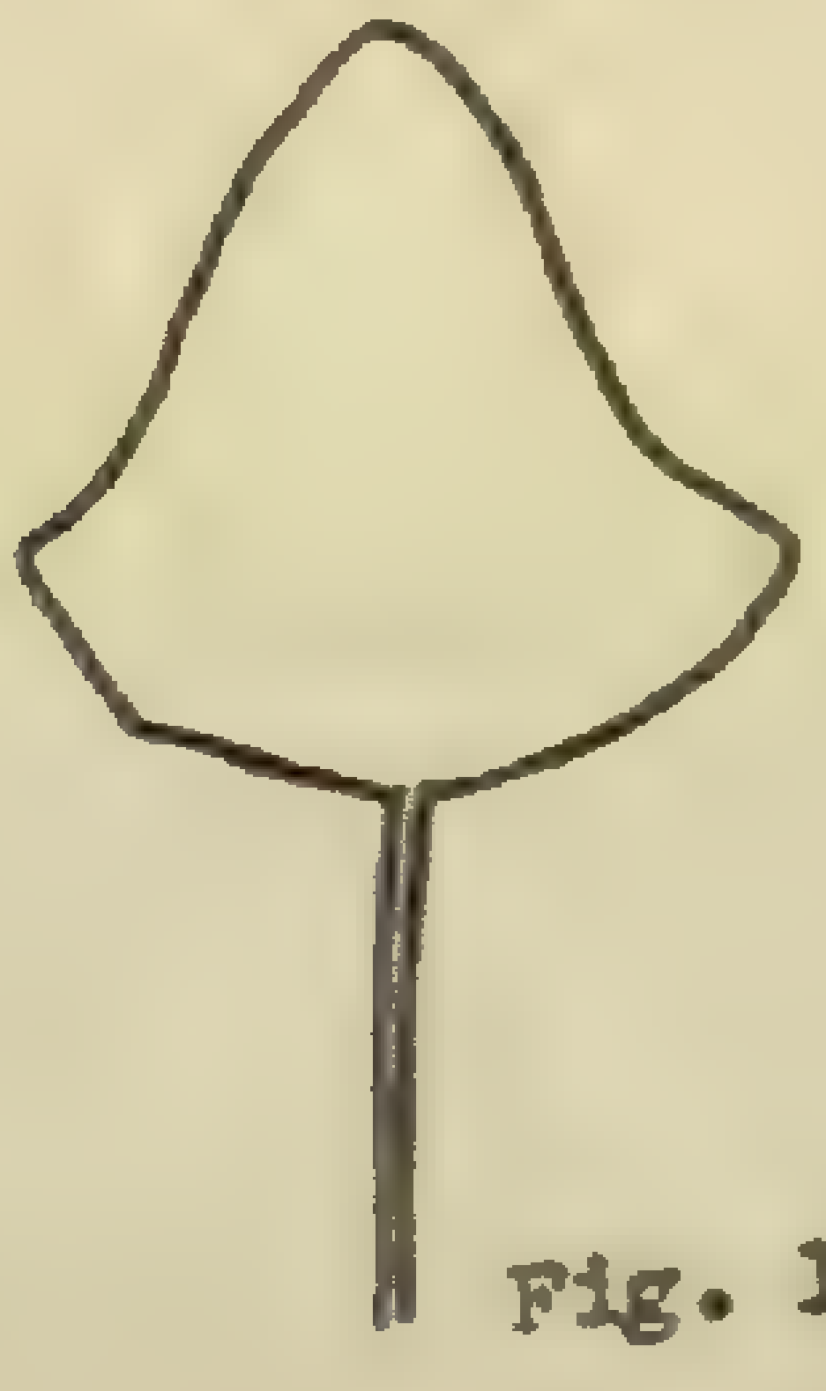


Fig. 14.

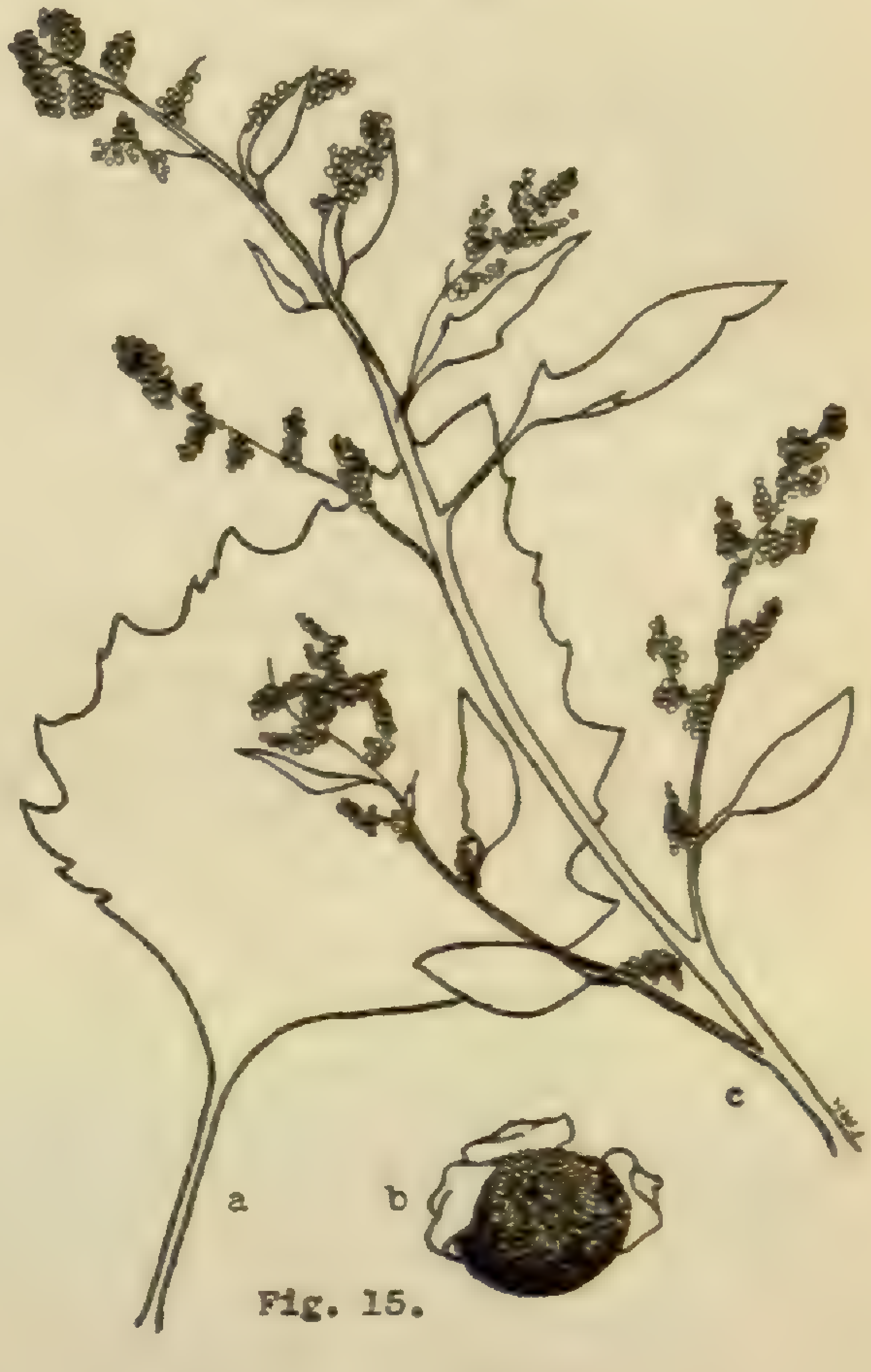


Fig. 15.

ssp. *platyphyllum* (Issler) Ludwig, a noteworthy northwestern thin-leaved series which may deserve separate varietal rank;

ssp. *Ludwigianum* Aellen, including smaller plants of more strict habit, the branches sometimes not exceeding the leaves, representing the northern tendency in the complex (not including *C. ferulatum* Lunnell).

These named taxa do not cover all the variation in *C. Berlandieri.* In Arkansas a large form with usually thin leaves and enlarged calyx has been collected at several places by Demaree. Arkansas material frequently does not fit in with presently recognized taxa, not only in the *Berlandieri* series but in other groups as well (cf. note under *C. strictum* var. *glaucophyllum*).

Also in the northwest, Wyoming to Oregon and northward into British Columbia and Mackenzie Basin (Raup 2263, 2269, 7060, and 7079 (NY.)), is a variant with strict habit, elongate leaves and finely reticulate and sometimes separable pericarp. The latter feature is extremely unusual in reticulate-seeded species.

C. Covillei Aellen is of uncertain status. The only American collection referred to this species (said to be also from Switzerland) is a plant shortly before anthesis, with sharply serrate rhombic-deltoid primary leaves and the upper ones with parallel-sided middle lobes as in var. *sinuatum*. It can hardly represent a separate species and, at best, determining material at this stage of development is a hazardous procedure. It connects satisfactorily with other plants from the Northwest, where there is indeed a tendency for the development in *C. Berlandieri* of the sharply serrate, hardly lobed, triangular-rhombic type of leaf, together with seeds in the smaller size range and sepals less prominently keeled. *C. Covillei* is included by Aellen in the smooth-seeded series, related to *C. album,* but although uncertain because of its young condition it seems to belong to the *Berlandieri* series. The variations of *C. Berlandieri* merit continued study.

47. *C. Bushianum* Aellen in Fedde Rept. Sp. nov. 26: 63. 1929.

This species has been generally recognized by its larger flattened seeds (Fig. 15) and included in the manuals as *C. paganum* Reichenb. The combination of large thin leaves and reticulate seeds 1.5–2.0 mm. broad produced in September makes it easy to recognize in the herbarium. In the field one is immediately attracted by the lighter green color (than *album* and *missouriense*) through early summer; by all the plants coming to flower the last week in August; then, through the Fall, the heavily drooping irregular inflorescences, usually lead-grey in color, and often on plants by this time leafless, are characteristic. In Illinois a thick (brittle) leaved form turns up in the region in which *C. album, C. Standleyanum* and *C. strictum* var. *glaucophyllum* also show this character.

C. Bushianum occurs most often as a weed of cultivated places but is found also in alluvium along streams and in waste places. The shade form is more delicate, and in its extreme the leaves become less prominently serrate and even entire. Aellen described forma *acutidentatum* with leaves sharply toothed, this occurring throughout the range. Var. *cinerascens* Aellen refers to the ordinary late-season stage in which the inflorescence takes on its characteristic lead-grey color. It does not have varietal significance. The stems often become red-striped, but this is a characteristic of any of the species that flower later in the season and are exposed to direct sunlight.

It is widely distributed in eastern North America; Massachusetts, Quebec, Ontario and North Dakota, south to Virginia and western Missouri. It probably exceeds these limits somewhat, but its relatively greater abundance in cooler regions indicates it may not be common south of the range given.

48. *C. macrocalycium* Aellen in Fedde Rept. Sp. nov. 26: 123. 1929.

Closely similar to some forms of *C. Berlandieri,* this species with its characteristic coastal distribution is distinguished by its generally thinner, coarsely but sparingly toothed, rhombic, lower leaves reduced upward to conspicuous lanceolate bracts; by its spreading pyramidal habit, less conspicuous or absent style base and enlarged calyx (Fig. 8). It is clearly separable from *C. album* and var. *lanceolatum,* to which collected material has most often been assigned, by its reticulate pericarp and lower leaves with little more than basal lobes, rather than being sinuate-dentate throughout.

Three possibilities as to its relationships suggest themselves: (1) it may have developed from the northeastern branch of the *Berlandieri* var. *Zschackei* complex (unlikely), (2) it may be a coastal development from the inland *C. Bushianum,* (3) (most likely) it may be a northward development, following the coastal plain, of the southeastern extension of *C. Berlandieri* var. *Boscianum.* Collections from the southern coastal plain, North Carolina to Florida, may throw light on this postulate and might even connect the groups varietally. Virginia material cited by Aellen under *C. Berlandieri* ssp. *Boscianum* probably belongs here. The material is in flower and determination is uncertain but the inflorescence is leafy to the tip and entirely suggestive of *macrocalycium.* Godfrey and Tryon 1562, Charleston Co., S. C. (US.) is also doubtful but probably belongs with *C. macrocalycium.*

The following citations indicate its distribution: CANADA: Newfoundland. Woody Island. Fernald, Long and Fogg 230 (leaves not typical) and 231 (typical), Sept. 1926 (both Penn. and PH.). New Brunswick. Youghal. Adams, Aug. 29, 1937 (OTB.). Prince Edward Island. Port Borden. Bassett 1689, Aug. 1950. Nova Scotia. Yarmouth Co.: Pembroke Shore. Fernald and Linder 21139, Oct. 1920 (PH.). Lunenburg Co.: Chester. Zinck 638, Aug. 1940 (NY., OTB.).

U.S.A.: Maine. York Co.: Ocean Park. Moldenke 6258, Aug. 1931 (NY.). Massachusetts. Rockport, Cape Ann. Bartram, Sept. 13, 1908 (PH.). Truro, Cape Cod (type locality). Reese, July 31, 1944 (PAC.). Barnstable Co.: Barnstable. Knowlton, Sept. 16, 1916 (PH.). Marion. Vail, Sept. 1888 (NY.). Duke Co.: Pasque Island. Fogg 3757, Aug. 1928 (Penn.). Martha's Vineyard. Seymour 1188, Sept. 1916 (NY., PH.). Nelson and Nelson 2558, Sept. 1937 (Ill.). Nantucket Island. Bicknell, Sept. 16, 1899, Aug. 4, 1906, Sept. 16, 1907, and 4018, Aug. 1909 (all NY.). Harshberger, Sept. 1, 1914 (Penn.). Rhode Island. Block Island. Fernald, Long and Torrey 9433, Sept. 1913 (NY., PH.). "W.B." (?), Aug. 9, 1929

(Ill.). New York. Long Island. Ferguson, July 27 and Aug. 28, 1920; 980, 1921; 3211 and 3234, 1924; 5197, 1926; Kearney, Oct. 6, 1894; Taylor 1543, 1903; Bicknell 3982, 1909 and 4014, 1914; Gilly 240, 1939; (all NY.). Bicknell 4010, 1914 (PH.). Staten Island. Hollick and Britton, June 27, 1916 (NY.). Harlem. Leggett, Fall of 1866 (NY.). Harlem River, Bicknell 3985, 1891 (NY.). Bronx Co.: Bronx. Moldenke 20566, Oct. 1949 (NY.). New Jersey. Bergen Co.: Oradell. Mackenzie 2492, Sept. 1906. New Durham. Mackenzie 4501, Oct. 1909. Ocean Co.: Barnegat Bay Beach. Harshberger, July 21, 1900 (NY.). Cape May Co.: Ocean City. Eckfeldt, Aug. 9, 1912; Reeds Beach, Ludwig 563, Sept. 1937; Town Bank, Ludwig 603, Oct. 1937; Green Creek, Ludwig 643, Oct. 1937 (all Penn.). Delaware. Kent Co.: Sandy beach, Persimmon Hummock. Larsen 1057, Sept. 1935 (Penn.) (somewhat uncertain). North Carolina. Carteret Co.: Sand banks near Beaufort. Lewis 122, 1906 (NY.). Indiana. Howard Co.: Ek, Sept. 21, 1940 (NY.). Where the ranges of *macrocalycium* and *Berlandieri* overlap it could be difficult to separate the former from thin-leaved forms of the latter. The Ek plant, although representing an isolated station and within the range of *C. Berlandieri*, is such characteristic material that one can have no hesitation to assign it to *C. macrocalycium;* the occurrence of Coastal Plain species in the Upper Mississippi-Great Lakes region is well known. Illinois. Champaign Co.: 8 mi. n.e. of Rantoul. Franklin, July 30, 1949 (Ill.). Atypical in appearance, in flower and very young fruit, this plant matches well the doubtful Delaware plant. No other disposition of the two presents itself.

As is the case with various other taxa in the genus *Chenopodium*, recognition of *C. macrocalycium* and study of its variations at the limits of its range may throw additional light on its specific relationships.

Bibliography

(1) Abrams, Leroy. Illustrated Flora of the Pacific States, Vol. 2, 1944. Stanford University, California.

(2) Aellen, Paul. Beitrag zur Systematik der *Chenopodium*-Arten Amerikas, vorwiegend auf Grund der Sammlung des United States National Museum in Washington, D. C. Fedde Rep. Spec. nov. Regn. veg. 26: 31–64, 119–160. 1929.

(3) ————. Nomenklatorische Bemerkungunen zu einigen Chenopodien. Ostenia (Festschrift für Cornelius Osten). Montevideo, Uruguay, 98–101. 1933.

(4) ———— and Just, Theodor. Key and Synopsis of the American Species of the Genus *Chenopodium* L. Amer. Midl. Nat. 30: 47–76. 1943.

(5) Fernald, M. L. Rhodora 51: 92. 1949.

(6) ————. Gray's Manual of Botany, ed. 8. American Book Co., 1950.

(7) Fosberg, F. R. Notes on North American Plants, I. Amer. Midl. Nat. 26: 690–695. 1941.

(8) Fuller, H. J. Photoperiodic responses of *Chenopodium quinoa* Willd. and *Amaranthus caudatus* L. Amer. Journ. Bot. 36: 175–180. 1949.

(9) Gleason, H. A. New Britton and Brown Illustrated Flora, Vol. II. New York Botanical Garden, 1952.

(10) Just, Theodor. *Chenopodiaceae,* pp. 418–427, in Deam, Flora of Indiana. Indianapolis, 1940.

(11) McVaugh, Rogers. Suggested Phylogeny of *Prunus serotina* and other wide-ranging Phylads in North America. Brittonia 7: 317–346. 1952.

(12) Standley, P. C. *Chenopodiaceae*. N. Amer. Flora 21: 1–93. 1916.

(13) ————. The *Chenopodiaceae* of northwestern South America. Field Museum Natural History, Bot. Ser. 11: 115–126. 1931.

(14) Watson, Sereno. A Revision of the North American *Chenopodiaceae*. Proc. Amer. Acad. Arts Sci. 9: 82–126. 1874.

The illustrations accompanying this article were drawn by Miss E. M. Hitch (now Mrs. Allen M. Woodruff). As figured the fruits are about 6 times natural size.

Spores, Sporangia and Indusia of the Genus Dryopteris in North America, north of Mexico

CLYDE F. REED, PH.D.
Reed Herbarium, Baltimore, Maryland

Modern taxonomists are becoming cognizant of the variability which a species may manifest under various ecological situations and are finding it necessary to select the more stable criteria with reduced variability potentialities upon which to base species. In the ferns much confusion has resulted when only leaf-cut, venation and scales have been used as specific characters. Such confusion in the genus *Dryopteris* in eastern United States initiated the present study of the genus, to find out not only what species are more closely related, but also whether characters based on spores, sporangia and indusia are not more dependable in establishing a species or variety than those characters more easily affected by such ecological factors as food and water supply, sunlight intensity, etc.

Microscopic characters are often shunned by the taxonomist in favor of the more visible ones, although they are just as, and perhaps more, pertinent to sound taxonomic classification. Thus, studies of genetics and wood anatomy have aided materially in the proper assignment of species to genera and of genera to families. Many of these characters are tied up in heredity and are not apt to be affected by ecology, except perhaps over a long period of time or under especially adverse conditions.

Such microscopic characters as—the surface reticulation, pitting or pebbling of the spore; the nature of the perispore and its markings which may be pits, spines or striations and its method of covering the spore; the nature of the cell-walls of the indusium as well as the presence or absence, and their characters when present, of spines or filamentous hairs or cilia protruding from the indusial cells; and the characters of the sporangia, as constancy or variability range, size and number of annular cells and the absence or presence, and then the position, of spines on the sporangial side-walls—will be discussed in this paper.

The generic name *Dryopteris* is used here in the broad sense, for convenience only, since the generic and subgeneric names applicable to the various groups of species need to be more thoroughly and accurately defined before they can be dogmatically used. Copeland in his Genera Filicum (1947) has segregated several species groups in the *Dryopteris*-complex into separate genera. For the species considered here, it will become apparent that some of Copeland's segregates are forced, when these microscopic characters are studied. The author has made extensive study of the tropical species of these segregates and it is on this basis that the few extending up into North America are considered at this time.

The taxonomy, for the most part, is that of the Eighth Edition of Gray's Manual by Fernald, 1950. Morton's treatment of the ferns in the new Britton & Brown leaves much to be desired, especially as to certain varieties and generic segregates, notably in the *Dryopteris*-complex and in *Pellaea*.

KEY TO THE SPECIES OF *Dryopteris* IN NORTH AMERICA, NORTH OF MEXICO

- A. Sporangia with spines.
  - B. Spines attached to the cells of the sides of the sporangia. *D. Phegopteris; D. hexagonoptera; D. subtetragona.*
  - B. Spines on the stalk of the sporangia with smaller spines on the side cells of the sporangia .... *D. patens.*
- A. Sporangia without spines (except *D. patens*).
  - B. Indusia with cilia or spines.
    - C. Cilia simple.
      - D. Cilia relatively short, spine-like. *D. simulata; D. Thelypteris var. pubescens; D. Thelypteris* var. *Haleana; D. noveboracensis; D. resinifera.*
      - D. Cilia long, filamentous, numerous. *D. patens; D. augescens* var. *puberula; D. normalis; D. dentata.*
    - C. Cilia forked .... *D. reptans.*
  - B. Indusia, if present, without emergences.
    - C. Perispore spiny.
      - D. Coarsely so, spores small, cells in annulus 12–13 .... *D. ampla.*
      - D. Finely so, spores medium in size to large, cells in annulus 13–14. *D. oreopteris.*
    - C. Perispore wavy.
      - D. Waviness acute, giving a wrinkled effect.
        - E. Cells of indusium with nearly parallel walls ... *D. Goldiana; D. marginalis.*
        - E. Cells of indusium with tortuous walls. *D. Filix-mas; D. celsa; D. ludoviciana; D. rigida* var. *arguta; D. patula; D. nevadensis.*
      - D. Waviness gentle, loose.
        - E. Indusium present.
          - F. Spore large, pits in the exospore. *D. cristata; D. Clintoniana; D. Clintoniana* var. *australis; D. Clintoniana* var. *atropalustris;* (*D. gongylodes*).
          - F. Spore medium, prickly exospore. *D. spinulosa* var. *fructuosa; D. spinulosa* var. *americana; D. spinulosa* var. *dilatata; D. spinulosa* (typical).
          - F. Spore small, prickly exospore .... *D. intermedia.*
        - E. Indusium apparently absent .... *D. disjuncta; D. Robertiana.*
    - C. Perispore very slight .... *D. fragrans; D. reticulata.*

SPECIES OF *Dryopteris* HAVING INDUSIA AND SPORANGIA WITH CILIA

D. Phegopteris and *D. hexagonoptera* have spines on the side cells of the sporangia, a characteristic not found in any of the other species of temperate eastern North America. The sporangia of *D. Phegopteris* have occasional single spines (figs. 43 and 44) on the upper cells, i.e. those contiguous with the cells of the annulus. In Figure 45 the sporangium of *D. hexagonoptera* shows several spines on the walls. The northern and southern plants of *D. hexagonoptera* differ in several ways. The annulus cell-count in northern plants varies from 10–13 cells, accompanied by a smaller number of spines on the sporangium and a less

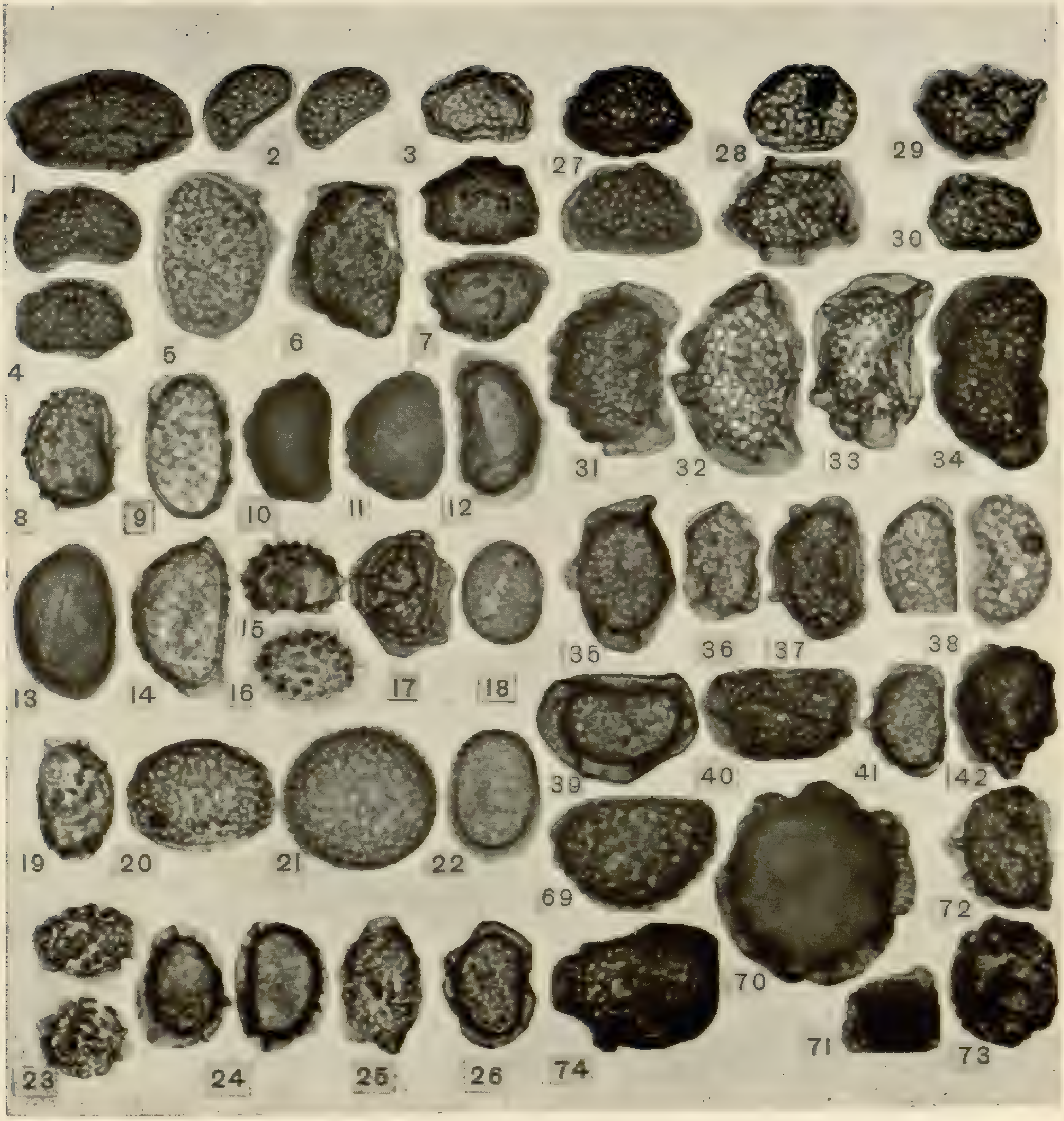

1
2
3
27
28
29
30
4
5
6
7
31
32
33
34
8
9
10
11
12
35
36
37
38
13
14
15
16
17
18
39
40
41
42
19
20
21
22
69
70
72
23
24
25
26
74
71
73

PLATE 1. Spores of *Dryopteris* species:

1, *Phegopteris*; 2, *hexagonoptera*; 3, *noveboracensis*; 4, *disjuncta*; 5, *simulata*; 6 & 9, *Thelypteris* var. *pubescens*; 7, *Robertiana*; 8, *Thelypteris* var. *Haleana*; 10 & 11, *normalis*; 12, *patens*; 13, *resinifera*; 14, *gongylodes*; 15 & 16, *ampla*; 17, *reptans*; 18, *fragrans*; 19, *dentata*; 20, *reticulata*; 21 & 22, *oreopteris*; 23, *marginalis*; 24, *subtetragona*; 25, *Filix-mas*; 26, *Goldiana*; 27, *rigida*; 28, *celsa*; 29, *ludoviciana*; 30, *patula*; 31, *cristata*; 32, *Clintoniana*; 33, *Clintoniana* var. *australis*; 34, *Clintoniana* var. *atropalustris*; 35, *spinulosa*; 36, *intermedia* var. *concordiana*; 37, *spinulosa* var. *fructuosa*; 38, *nevadensis*; 39, *spinulosa* var. *dilatata*; 40, *spinulosa* var. *americana*; 41, *intermedia*; 42, *Clintoniana* × *Filix-mas*; 69, *augescens* var. *puberula*; 70, *Clintoniana* × *intermedia*; 71, *marginalis* × *spinulosa*; 72, *cristata* × *spinulosa*; 73, *Clintoniana* × *spinulosa*; 74, *cristata* × *marginalis*. Magnification about × 200.

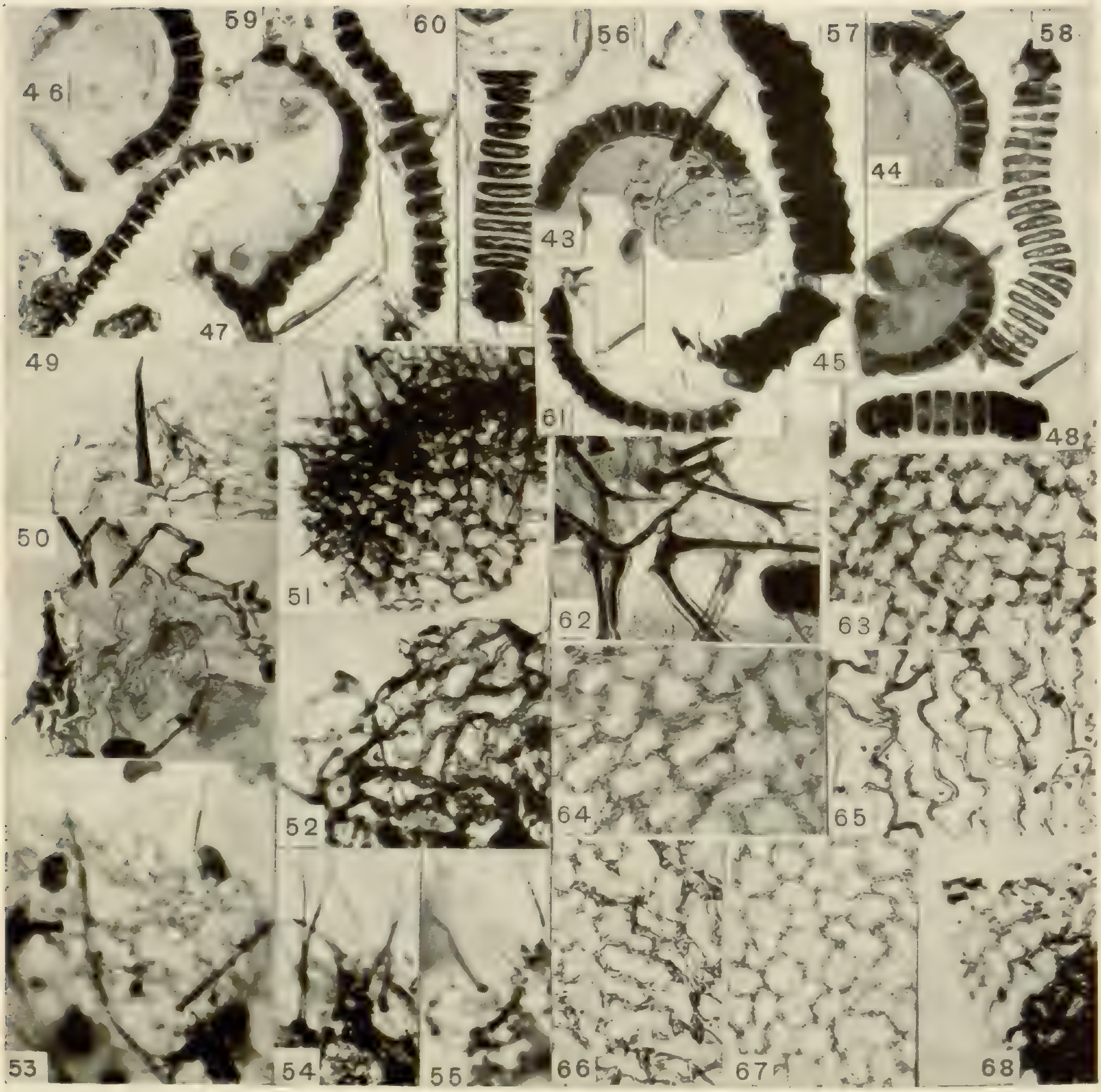

46
59
60
56
57
58
44
43
47
45
49
61
48
50
51
62
63
52
64
65
53
54
55
66
67
68

PLATE 2. Cell-features of *Dryopteris* species:

Sporangia: 43 & 44, *Phegopteris*; 45, *hexagonoptera*; 46 & 47, *patens*; 48, *subtetragona*; 56, *cristata*; 57, *reticulata*; 58, *fragrans*; 59, *Clintoniana* × *marginalis*; 60, *Clintoniana* var. *atropalustris*; 61, *spinulosa*.

Indusia: 49, *simulata*; 50, *Thelypteris* var. *pubescens*; 51, *dentata*; 52 & 55, *augescens* var. *puberula*; 53, *normalis*; 54, *patens*; 62, *reptans*; 63, *Goldiana*; 64, *Clintoniana* var. *atropalustris*; 65, *fragrans*; 66, *Clintoniana*; 67, *ludoviciana*; 68, *marginalis*. Magnification about × 50.

pronounced cutting of the pinnae than southern plants which range northward through Maryland and Pennsylvania and have 13–16 cells in the annulus accompanied by numerous spines on the sporangia and very deep cutting.

D. Phegopteris (fig. 1) has certain tendencies in the spore to *D. simulata* (fig. 5) and *D. Thelypteris* var. *pubescens* (figs. 6 and 9) and var. *Haleana* (fig. 3), whereas *D. hexagonoptera* (fig. 2) leans more toward *D. noveboracensis* (fig. 3) in spore size and in annulus cell-count. Southern *D. hexagonoptera* varies in the annulus cell-count from 13–16 and *D. noveboracensis* from 13–15. The annulus cell-count in *D. Phegopteris* is 13, rarely 14. However, in *D. simulata* the count is 15–16 and in *D. Thelypteris* var. *pubescens* from 19–23 and in var. *Haleana* from 13–17. The spores of var. *pubescens* (figs. 6 and 9) are larger than those of var. *Haleana* (fig. 8), the probable reason for a larger sporangium with more cells in the annulus.

D. simulata, D. Thelypteris var. *pubescens* and var. *Haleana* and *D. noveboracensis* lack sporangial spines, but, instead, have spine-like protuberances on the indusia (fig. 49, *D. simulata;* fig. 50, *D. Thelypteris* var. *pubescens*). These are not mere hairs or cilia, but are stiff emergences, similar to the sporangial spines in *D. Phegopteris* (figs. 43–44), and *D. hexagonoptera* (fig. 45). This group of species have few, simple, relatively short spines on the indusia.

A Floridan species, *D. resinifera,* has a spore (fig. 13) quite different from that of other species in this group, and its annulus has 13 cells. This species can be better evaluated after a study of the characteristics of additional tropical species has been completed.

Another group of species has simple, long, numerous, but filamentous cilia on the indusia, including *D. patens* (fig. 54), *D. augescens* var. *puberula* (figs. 52 and 55), *D. normalis* and *D. dentata,* all of which belong to tropical and subtropical regions from Florida southward to the West Indies, Bahamas and South America. Figures 51 and 55 show the positions of these in the cells. The indusium of *D. normalis* (fig. 53) shows cells which have lost their cilia, exhibiting the way in which the cilia emerge. The annulus cell-counts of all these species vary from 15–17, rarely 14. *D. patens,* varying from 14–17 cells in the annulus, differs from the other members of this group in having spines on the stalk of the sporangia, with a few aborted filamentous protuberances on the side-cells, as shown in Figure 47. When these protuberances are absent, large dark areas replace them, as seen in Figure 46. The cilia in the indusia of *D. dentata* are shorter and stiffer than others in this group (fig. 51), yet they are numerous, and thus this species differs from *D. simulata, D. Thelypteris* and *D. noveboracensis.* The spores of *D. patens* (fig. 12) and *D. normalis* (figs. 10 and 11) show some similarities, while *D. dentata* (fig. 19) differs from the others in this group in perispore architecture and in size of spore. The spores of *D. augescens* var. *puberula* (fig. 69) are quite different from those of *D. patens* and *D. normalis.* All of the foregoing species are placed in the genus *Lastrea* by Copeland (Gen. Fil., pp. 138–140. 1947).

With *D. oreopteris* it is a different story. This fern of Alaska, northwestern North America, and Europe is the genotype of *Lastrea,* according to Copeland (Gen. Fil., p. 136. 1947). It is unfortunate that Copeland chose to throw in some 500 other species, mainly from the tropics, making a heterogeneous junk-pile, which was already in considerable disrepute due to the presence of such names as *Thelypteris, Phegopteris,* etc.

In Copeland's diagnosis of the genus *Lastrea* little is said about indusia and spores, and nothing concerning the fact that all the species included above from *D. hexagonoptera* to *D. normalis* have spines on the sporangia or indusia, as do a great number of Copeland's species of *Lastrea* but not *D. oreopteris;* mention is made of bilateral spores for all the species allocated to the genus, ignoring the fact that the type species, *D. oreopteris,* is quite different from all the others in its spores being nearly globose in one plane and ovoid in the other (figs. 21 and 22). Nothing is said concerning the perispore of *D. oreopteris* being unique among the 500 species putatively related to it, in its being prickly. The cell-count in the annulus is 13–14 for *D. oreopteris.* Amazing that such an atypical species should be taken as the type of a genus of over 500 species which have so little in common with it!

After a preliminary study of a couple of hundred species placed by Copeland in *Lastrea,* the author has been unable to find any character or set of characters in the spores, sporangia or indusia which would hold all of them to *D. oreopteris,* hence to *Lastrea.* Should any students of ferns say that the characteristics of the spores, sporangia and indusia are not pertinent, my reply would be to study the slides of over 700 species of ferns as represented in my collection. When genera and species of ferns can be accurately identified by only the spores and sporangia, these must be of some value in taxonomic considerations.

One species of *Dryopteris* lacking spines on the sporangia, but possessing large once- to thrice-forked stiff emergences on the indusia is the Floridian *D. reptans* (fig. 62). Its spores (fig. 17) stand alone also among North American species of *Dryopteris,* and better fit in with some other tropical species of the genus. The annulus cell-count varies from 17–19.

Spines do occur on the sporangia in *D. subtetragona* (fig. 48) of Florida. Its spore (fig. 42) could possibly fit into the *D. Phegopteris-D. simulata-D. Thelypteris*-complex, closest to *D. Phegopteris.* The annulus cell-count is 14 for *D. subtetragona* and 13 for *D. Phegopteris.*

Another unique *Dryopteris* is *D. ampla* of Florida. Its perispore has large protuberances situated directly over the papillae on the surface of the spore (figs. 15 and 16), giving an echinate appearance. This species has been transferred to *Ctenitis* by Copeland (Gen. Fil., p. 124. 1947), and its spore and perispore characteristics truly best fit that genus. The annulus cell-count is 12–13.

Species of *Dryopteris* lacking Cilia on Indusia or Sporangia

Characters of the perispore and spore architecture are the main criteria separating the remaining species of *Dryopteris* found in North America, while cell characteristics of the indusium are sometimes also helpful. These species are treated by Copeland under *Dryopteris,* with *D. Filix-mas* as genotype.

The perispores of the species comprised here may be divided into two main groups: (1) those with an acute waviness which gives a wrinkled effect to the spore, and (2) those in which the perispore is loose. To the first group belong *D. marginalis, D. Goldiana* and *D. Filix-mas* and their close relatives; to the second group belong three sets of species centered around *D. cristata, D. Clintoniana, D. spinulosa* and *D. intermedia.*

The first main group may be further divided into two minor groups of species: those having the cells in the indusium respectively in parallel files with nearly straight walls, and in irregular patterns with bending tortuous walls.

To the straight-walled parallel-celled sub-group belong *D. Goldiana* and *D. marginalis* and its forms. In Figure 63 the parallel files of cells of the indusium of *D. Goldiana* are quite evident, in Figure 69 of that of *D. marginalis.* The annulus cell-count in *D. marginalis* is 13–15, forma *elegans* 12–14; in *D. Goldiana* 13–14. The spores of *D. marginalis* (fig. 23) are small as compared to other species in this large wavy perispore group.

The spore of *D. Goldiana* (fig. 26) represents a beginning of a long line of species and varieties in the Eastern North American ferns related to *D. Goldiana, D. cristata* and *D. Clintoniana.*

Between *D. Goldiana* and *D. Clintoniana* lies a series of species having acute waviness of the perispore, but with tortuous walls in the cells of the indusium. *D. celsa* is the connecting species of this group, which includes *D. Filix-mas, D. ludoviciana* (fig. 67), *D. rigida* var. *arguta* and *D. patula.* The spores of all these show similarities in pitting and perispore orientation. However, the species fall into two subgroups: one in western United States, including *D. rigida* var. *arguta, D. patula* and *D. nevadensis,* the other in eastern, including *D. celsa* (fig. 28), *D. Filix-mas* (fig. 25) and *D. ludoviciana* (fig. 29), leaning toward *D. marginalis* in spore characters. The indusium of *D. Filix-mas* is very similar to that of *D. celsa.* The annulus cell-count for *D. Filix-mas* is 14–16, for *D. ludoviciana,* 13–14, and for *D. celsa,* usually 13.

The western species, *D. patula* and *D. rigida* var. *arguta,* have respectively 14–17 and 13–16 cells in the annulus. The spores of these species are alike (figs. 27 and 30), those of *D. rigida* var. *arguta* being a little larger than those of *D. patula* (fig. 30). The indusia of *D. patula* and *D. rigida* var. *arguta* are similar, but *D. rigida* var. *arguta* has tendencies toward *D. nevadensis.* The spore of *D. nevadensis* (fig. 38) is similar to others in this group and the annulus has from 14–16 cells. However, *D. nevadensis* also has tendencies toward *D. Thelypteris* varieties in spore architecture, spore size and annulus cell-count. The indusia lack the spines in their cells, so characteristic of *D. Thelypteris.* The bending tortuous walls of the cells of the indusium are found throughout this group. This bending is also found in a subarctic species, *D. fragrans* (fig. 65), having from 18–22 cells in the annulus (fig. 58), its variety *remotiuscula,* 19–20. The spores are very smooth, there being a tight fitting perispore (fig. 18).

As mentioned earlier, *D. Goldiana* stands at one end of a series containing *D. cristata* and *D. Clintoniana. D. celsa* affords a stepping stone from *D. Goldiana* to the *D. Clintoniana*-complex in spore characters, in indusial cell irregularity and sporangial makeup. Since *D. cristata* is found in Europe, but *D. Clintoniana* is not, and since in central eastern North America great fluctuation exists in areas where *D. Clintoniana* lives, it is reasonable to believe that this is the species with the greater variability potentialities. One of the varieties is found below the Fall Line (i.e., the geological boundary between the Coastal Plain and the Piedmont Plateau in eastern United States), namely *D. Clintoniana* var. *atropalustris* (Small) Reed [Bull. Nat. Hist. Soc. Maryland 13: 51. 1943]. The spores of this variety (fig. 34) fit very well into the *Goldiana-Clintoniana*-complex. The leaf-cut resembles to some degree that of *D. Goldiana,* but the spore is closer to *D. Clintoniana* in size, architecture and perispore. Another variety of *D. Clintoniana* is var. *australis* which is found above the Fall Line in swampy places. The spores of var. *australis* (fig. 33) are smaller than those of var. *atropalustris* (fig. 34) and of typical *D. Clintoniana* (fig. 32). Not only does the leaf-cut of var. *atropalustris* tend to *D. Goldiana,* but also the cells of the indusium (fig. 64) are more or less regular, sub-parallel walled. Thus var. *atropalustris* stands between *D. Goldiana* and *D. Clintoniana* in many features. The range in variability in annulus cell-count in var. *atropalustris* (fig. 60) is 13–14, similar to *D. Goldiana.* It is difficult to say whether var. *atropalustris* is a variety of *D. Clintoniana* or of *D. Goldiana,* and from all evidence in distribution it might be a fertile hybrid, but due to the fact that *D. Clintoniana* usually is found with var. *atropalustris,* the author considers it a variety of the very variable *D. Clintoniana.* The potentialities in this species will be considered further when hybrids and their relative abilities to propagate themselves by spores are discussed.

The spore of *D. Clintoniana* (fig. 32) is the largest of this group. The indusial cell structure (fig. 66) is not too far removed from that of *D. cristata,* even though the annulus cell-counts are significant, since that of *D. cristata* is 13–14 and that of *D. Clintoniana* is 13–16. The spore of *D. cristata* (fig. 31) is similar to that of *D. Clintoniana.* A top view of the sporangium of *D. cristata* is shown in Figure 56, bringing out the broad narrow cells of the annulus. In Figure 60 the side view shows the nature of these cells for *D. Clintoniana* var. *atropalustris.*

D. cristata is found in Europe, but *D. Goldiana* is not; likewise, × *D. Clintoniana* is a North American entity, further substantiating its hybrid nature from *D. cristata* and *D. Goldiana* rather than being a variety of *D. cristata.* The genetics of this group needs to be thoroughly studied.

Another group of species centers around *D. spinulosa*. There is some indication that *D. cristata* may have been ancestrally close to this group. The most significant character here is the fine prickliness of the perispore, of which there are traces in the spore of *D. cristata* (fig. 31). In *D. spinulosa* there is a consistent annulus cell-count from 12–14. The size of the cells in the annulus of *D. spinulosa* (fig. 61) is smaller than in *D. cristata* and *D. Clintoniana,* and so are the spores smaller. The varieties of *D. spinulosa,* var. *fructuosa* (fig. 37), var. *americana* (fig. 40) and var. *dilatata* (fig. 39), show many of the spore characters of *D. spinulosa* (fig. 35) in size, architecture and perispore. A smaller spore is found in *D. intermedia* (fig. 41), as well as smaller cells in the indusium. The cells of the indusium of *D. spinulosa,* its var. *fructuosa* and var. *americana* are very similar in sizes and structure. The spores of *D. intermedia* var. *concordiana* (fig. 36) are smaller than those of other varieties and forms of *D. spinulosa,* and grade into those of *D. intermedia.*

One other group of species in eastern North America includes *D. disjuncta* (*D. Linnaeana*), its form *glandulosa,* and *D. Robertiana.* The spores of *D. disjuncta* (fig. 4) and *D. Robertiana* (fig. 7) are quite similar in size, architecture and perispore. In *D. disjuncta* the cell-number of the annulus varies from 10–11; in the form *glandulosa,* from 11–13; and in *D. Robertiana,* from 11–12. Among the species of *Dryopteris* in North America this group stands alone, and until more species of the tropics are studied it is uncertain in what section they belong.

HYBRIDS AND VARIATIONS AMONG THE NORTH AMERICAN SPECIES OF *Dryopteris*

Genetic variability and hybridity are two different processes causing variation in a population. Taxonomists to date have not considered this matter when naming a plant, with the result that to write × *D. Clintoniana* is meaningless unless sufficient genetic data are at hand. To say the phenotypic expressions of factors validate the genetic relationships is not sound. Because a plant has the leaf-cut of one and the marginal serration of another parent, relationship does not necessarily follow, because genetic variation or mutability could account for the difference without a new set of genes from another parent, which hybridity would involve. However, this has been the method by which most of the hybrids have been named. Further, to establish varieties or forms again presupposes that we know that the plant at hand is only a genetic variation. Ecological variations or forms have in general not been separated from variations due to genetic mutations or from hybrids.

All the eastern North American species of *Dryopteris* proper, belonging to the *D. marginalis-Goldiana-cristata-spinulosa*-complex, have formed hybrids. Traditionally, the parents are listed alphabetically, with no indication from which the male or female component was derived. For the time being, the author follows this plan. A hybrid produced by male *Clintoniana* cells and female *margi-*

nalis cells may be markedly different from one produced by male *marginalis* cells and female *Clintoniana;* such reciprocal hybridization may well be the cause for the wide variation in specimens often called the same hybrid.

A brief summary of the hybrids of this group follows. The first set involves the type species of *Dryopteris, D. Filix-mas.*

a) *D. Filix-mas* × *marginalis.* This hybrid retains more of the characteristics of the indusium of *D. Filix-mas* than of *D. marginalis* (fig. 68), showing none of the parallel-celled indusial cells of the latter.

b) *D. Clintoniana* × *Filix-mas.* Besides showing the irregular thin cell walls characterizing the indusium of *D. Filix-mas,* the spores of this hybrid are also more like those of that parent. (Compare figures 25 and 42.)

c) *D. Filix-mas* × *spinulosa.* (× *D. remota* Braun). This hybrid differs from *D. Filix-mas* in the longer stalk, broader blade, almost completely pinnate pinnae and the spinulose-mucronate teeth; from *D. spinulosa* in the stouter stalk, narrower blade, less divided pinnae and shorter-pointed teeth. This hybrid is also recorded as being highly sterile by Manton [Brit. Fern Gaz. 7: 165. 1938; Hyde & Wade, Welsh Ferns, p. 100. 1949]. Besides being found in the United States, it is also known in Wales and Germany.

d) *D. Filix-mas* × *oreopteris.* This is a remarkable cross, if real. An account of this hybrid in North America was given by the author [Amer. Fern Journ. 37: 53–54. 1947], after it had been described from British Columbia by Ewan in 1944. Reed pointed out that the same hybrid had been recorded by Domin from Subcarpathian Russia in 1929. Whether the American plant is really a hybrid of these two species was doubted by Ewan since " there was no sign of *D. Filix-mas* anywhere ", and " the form of the lobes and the position of the sori approach *D. oreopteris* ". It may be only a variation of the latter. If Copeland's typifications of *Dryopteris* by *D. Filix-mas* and of *Lastrea* by *D. oreopteris* are valid, and they appear to be so, then this is a bigeneric hybrid, just as *Asplenosorus* is, but without a name. It is interesting that *D. oreopteris* is the only member of the *Lastrea*-complex that hybridizes with any of the true dryopterids. But then again it is unlike everything else placed with it by Copeland in Genera Filicum.

The next set of hybrids centers around *D. marginalis.*

e) *D. Goldiana* × *marginalis.* (× *D. Leedsii*). This hybrid shows characters of the indusium unlike either of its parents, both of which have nearly parallel-walled cells. The scales on the stipe are dark centered like those of *D. Goldiana.*

f) *D. cristata* × *marginalis.* (× *D. Slossonae*). This shows more of the features of *D. cristata* in the spore (fig. 74). The other characteristics are intermediate between the two parents.

g) *D. Clintoniana* × *marginalis.* This retains more of the characters of *D. Clintoniana* than of *D. marginalis,* especially in the indusial cells. Its sporangia are small and often sterile (fig. 59) and without spores (in the specimens studied). The characters of *D. cristata* and *D. Clintoniana* seem to dominate those of *D. marginalis.*

h) *D. marginalis* × *spinulosa.* (× *D. pittsfordensis*). In this, *D. marginalis* seems to dominate the characters of *D. spinulosa,* as indicated by the regimented cells of the indusium and the spore features (fig. 71). The spores in the specimens studied were not well formed.

i) *D. intermedia* × *marginalis.* This hybrid was not studied.

Additional hybrids of *D. Goldiana* comprise:

j) *D. cristata* × *Goldiana.* (× *D. atropalustris* Small). This hybrid shows stronger characters of *D. cristata,* especially in the indusial cells. Its spores are shown in Figure 34, where this plant (the specimens from Kent Co., Delaware) is treated as a variety of *D. Clintoniana.* The reasons for this are: the spores are very like those of *D. Clintoniana,* not those of *D. cristata,* and definitely unlike those of *D. Goldiana;* the plants grow on the Coastal Plain a great distance from any plants of *D. Goldiana,* the nearest known locality being on the Piedmont in upper New Castle Co., Delaware; both *D. cristata* and *D. Clintoniana* have been collected by the author in this Delaware swamp. The southern specimens of × *D. atropalustris* which Small had may be something different.

k) *D. Goldiana* × *spinulosa.* (*D. Clintoniana* forma *sylvatica* Poyser). This shows strong *spinulosa*-characters. No spores of it were obtainable in this study.

l) *D. Goldiana* × *intermedia.* (× *D. separabilis* Small). This hybrid has many of the features of the *D. intermedia* parent including the numerous secondary leaflets. Its spores were not studied.

m) *D. Clintoniana* × *Goldiana.* (× *D. celsa* (Palmer) Small). The spores (fig. 28) are intermediate in size and characters between those of *D. Goldiana* (fig. 26) and of *D. Clintoniana* (fig. 32). So far as is known *D. celsa* does not form hybrids with any other species of this complex.

The hybrids of *D. cristata* show its predominating influence over the indusial characters of the other species, except with *D. spinulosa.*

n) *D. cristata* × *spinulosa.* (× *D. uliginosa* Newm.). This hybrid has spores (fig. 72) which are intermediate between those of *D. cristata* and *D. intermedia* or *D. spinulosa.* The indusium has cells somewhat like those of *D. marginalis* × *spinulosa,* only thinner. Manton (*l.c.,* p. 165) and later Hyde & Wade (*l.c.,* p. 100) state that this hybrid is highly sterile in Wales and Europe, due to spore abortion which has been brought about by irregular chromosome pairing. Abnormal spores were quite frequent in the slides of American specimens studied.

o) *D. cristata* × *intermedia.* (× *D. Boottii*). In this plant the indusial cells are similar to those of *D. spinulosa* and *D. intermedia.*

The remaining hybrids are those of *D. Clintoniana* with two others:

p) *D. Clintoniana* × *spinulosa.* This hybrid has small irregularly shaped spores (fig. 73), probably sterile, brought about by uneven chromosome pairing.

q) *D. Clintoniana* × *intermedia.* The spores of this hybrid are large, probably lacking the final cell division of the tetrad of spores (fig. 70), but exhibiting the prickliness of the perispore characteristic of *D. intermedia* (fig. 41).

There are a few other species of the dryopterids which have been placed in the genus *Dryopteris* in the past, but now are variously assigned to closely related genera. These are found in the tropics and barely reach continental North America by way of southern peninsular Florida.

D. gongylodes (= *Cyclosorus goggilodus*) represents one of these tropical species, and should not be placed among typical North American ferns until a similar study of the tropical ones is completed. However, for comparison, Figure 14 shows the spore of this species. This is the genotype of the genus *Cyclosorus* which according to Copeland (Gen. Fil., p. 141. 1947) contains about 300 species.

Two other tropical species reaching up from South America are *D. reticulata* and *D. serrata,* which range as far north as southern peninsular Florida and are again included only for comparison. The spore of *D. reticulata* (fig. 20) represents a different type than any other known among the North American species of *Dryopteris.* The sporangia (fig. 57) of *D. reticulata* are quite large and have about 17 cells in the annulus. Both of these species have been placed in the genus *Meniscium,* for which *D. reticulata* is the genotype.

The data presented in this paper are based upon several hundred actual indusial cell-counts from slides of each species taken from different sheets of the same species and often from different localities; the spores illustrated represent typical ones for a given species. It must be understood that since only a single spore has been selected for illustrating the species, there will be some variation when many spores are studied, which should be kept in mind when comparing any one illustration with material from several sheets. Also, the spores must be cleared properly to be compared with the illustrations herein. These preparations have all been cleared in clarite.

From these preliminary studies of the comparative morphology of the spores, sporangia and indusia of species of the *Dryopteris*-complex in North America, there are definite indications that these characters not only are substantially uniform for a species and tend to hold ecological variants together, but also manifest sectional uniformities which can aid in properly placing species within a genus or subgenus, or even in distinguishing between closely related species or genera. In a more compendious work, the spores of all known species of ferns will be illustrated.

Color Variations of Two Plants in the Southern Appalachians

RALPH M. SARGENT
Haverford, Pa.

1. *Habenaria ciliaris.* This handsome fringed orchid is described in both *Gray's Manual*, 8th ed., editor Fernald, p. 473, 1950, and the *New Britton and Brown*, editor Gleason, Vol. 1, p. 462, 1952, as orange in hue. The present writer has seen *H. ciliaris* in many locations throughout its range, and with the exception about to be mentioned, has found this color characterization to be accurate.

Correll, however, in *Native Orchids of North America*, p. 64, 1950, describes *H. ciliaris* as having " Flowers bright yellow or deep orange." The present writer has observed in two separate, but similar, locations in the mountains of western North Carolina communities of *H. ciliaris* producing distinctly lemon yellow flowers; the hue could by no means be described as " bright yellow ". The first of these locations is on Yellow Mountain in the Blue Ridge, near Highlands; the second, some 40 miles distant, on the Devil's Courthouse, a landmark in the Balsams near Brevard. Both are at an altitude of approximately 5,000 ft., in small depressions in granite rock, moist, but fully exposed to the sun. In that on Yellow Mountain typical orange-flowered *H. ciliaris* also occurs, and gradations between this and the lemon yellow form can be found. At the Devil's Courthouse, only the yellow form has been noted.

The existence of these lemon yellow Habenarias at once raises the question of hybridization: Are they the product of *H. ciliaris* × *H. blephariglottis*? As long ago as 1836 Rafinesque, in his Flora Telluriana, described a *Habenaria bicolor* in his characteristic style: " Apparently a hybrid of 128 and 131 [*H. bleph.* & *H. cil.*]. Yet Orchides cannot produce hybrids, the fecundation being so intimate; it is rather a deviated N. Sp. beautiful, the yellow is pale nearly buff color."

In our own country, Ames recognized two hybrids of *H. cristata: H. Chapmani* (*H. cristata* × *H. ciliaris*), and *H. Canbyi* (*H. cristata* × *blephariglottis*). Although *H. cristata* grows in the Flat Rock bogs, some 30 miles from one location of the lemon yellow Habenarias referred to in this note, there is no question of this orange orchid being one of the parents of the (possible) hybrid.

However, Correll (p. 64) did record the occurrence of (probable) hybrids between *H. ciliaris* and *H. blephariglottis:* " The rich golden yellow flowers of *H. ciliaris* contrast vividly with the snow-white flowers of *H. blephariglottis*. Where these two orchids occur in proximity, plants with pale cream-colored flowers are often found, doubtless representing a hybrid population of these closely allied species." It is worth noting that Witmer Stone, Plants Southern N. J., p. 368, 1911, considered Rafinesque's *H. bicolor* to be *H. ciliaris* × *H. blephariglottis*.

The interesting point about the lemon yellow *H. ciliaris* in the N. C. mountains is that it occurs without the presence of *H. blephariglottis.* There is no record, in fact, of the latter at that altitude there: Correll gives the range for *H. blephariglottis* in N. C. from sea level only to 2,000 ft.; for *H. ciliaris,* up to 5,500 ft.

Correll (p. 62), under *H. Chapmani,* records this further discovery: "Specimens of what I consider to be typical × *H. Canbyi* were collected in Hardin County, Texas. However, so far as can be determined, *H. blephariglottis* (except for a probable disjunct station in Galveston County, Texas) has neither been reported nor collected in the South any farther west than Mississippi, whereas *H. ciliaris* occurs rather abundantly in eastern Texas. The occurrence of typical × *H. Canbyi* in Texas, in consideration of the apparent lack or rarity of *H. blephariglottis* in both Louisiana and Texas, is most disconcerting and arouses suspicion as to which species are the true parents of this hybrid." Can it not be that the light yellow *Habenaria* which occurs in Texas, as in the mountains of N. C., without the presence of *H. blephariglottis,* represents a similar phenomenon?

In any case, two explanations seem possible for the existence of the lemon yellow *Habenaria* in the N. C. Appalachians: (1.) a hybrid of *H. ciliaris* × *H. blephariglottis* has been able to maintain itself after the disappearance of one of its parents from the habitat, or, (2.) lemon yellow is a true color form of *H. ciliaris.* These North American Habenarias, and the problem of their hybridization, would seem to deserve further study.

2. *Clintonia umbellulata.* The fruit of this species is listed as black in both *Gray's Manual,* 8th ed., p. 439, and in the *New Britton and Brown,* Vol. 1, p. 425. The color of the fruit has sometimes been regarded as a distinguishing field mark from *C. borealis,* whose berries are blue, or even white. Harned, however, in *Wild Flowers of the Alleghanies,* p. 117, 1931, noted the existence of a *Clintonia* showing floral characteristics of *C. umbellulata* but producing blue fruit and named it *C. allegheniensis.* Fernald, *loc. cit.,* suggests this as a possible hybrid between *C. umbellulata* and *C. borealis.* It has apparently not been reported outside of West Virginia. The writer records that he has observed in the Blue Ridge Mountains, near Highlands, N. C., at altitudes from 3,000 to 4,500 ft., many specimens of *C. umbellulata* with blue berries. The color in different specimens ranges all the way from a dark navy blue to the most brilliant sky blue. *C. borealis* does not occur at this altitude in this locality.

A Field Trip to the New Jersey Pine Barrens

This résumé of the June field trip of the Philadelphia Botanical Club is written from the viewpoint of an amateur, so as to record the value of the trip to the layman. To name all the plants identified would prove tedious and uninteresting. Lists of the blooming and fruiting time of Pine Barrens plants are available elsewhere and to make another such list would serve no purpose. In any study or observation it is frequently the little homely stories and phrases of description that give most meaning and feeling, and so it often was on this occasion. It is the writer's purpose to tell of the things outstanding in her memory of the day, of the sometimes small but intimate bits of information gained, and of the really spectacular floral displays.

On Saturday, June 5, 1954, at 1:00 P. M., a cavalcade of five automobiles left the Academy of Natural Sciences to be joined at Medford, New Jersey, by two others. We were fortunate in having as members of the group several experienced botanists, including Dr. Edgar T. Wherry, the leader, and Dr. Robert B. Gordon, Mr. Louis E. Hand, Dr. Theodore P. Haas, Mr. Harry W. Trudell, and Mrs. Ida K. Langman.

The first stop was made shortly after passing Ellisburg on N. J. Route 70, where Dr. Wherry pointed out an unusually fine specimen of sour gum, *Nyssa sylvatica*. I think usually of the *Nyssa* as an unimpressive tree growing in the confines of the woods. The tree at which we now looked had had, in an open field, opportunity to develop its true form and was a beautiful example of the picturesque, irregular outline the *Nyssa* will assume when given room to grow. As there were so few leaves we could see the branches and strong framework of the tree in a way that would not otherwise have been possible. This *Nyssa* is well known to botanists and is pointed out to students; yet many of the present group had often passed the spot unobserving. At this stop also we saw *Rubus laciniatus*, the cut-leaved blackberry which, though not native, has spread widely over the country. Its hooked prickles and laciniate-cleft leaf once seen will always be recognized.

Our first impression on entering the true Pine Barrens, beyond Medford, was of the beauty and abundance of the laurel, *Kalmia latifolia*. All day the delicate coloring of these flowers greeted and surrounded us. We stopped to see a stand of lupine, growing in the very middle of a typical Pine Barrens road. The flowering period was finished, but the plants still bore their seed pods. On the white oaks at this spot were many white oak galls, like fluffy cream colored cotton balls, each with beautiful red dots. The gall-wasp or fly which causes these galls will pass by other species of oak and go only to the white oak. Mr. Trudell cut open one of the galls, revealing the grubs within, which to the uninitiated might be mistaken for seeds in a fruit.

Any study of the Pine Barrens plants would of necessity center largely on the heath family, and it was so today. We noted the delicate fragrance of the *Leucothoe racemosa.* We saw the sheep laurel, *Kalmia angustifolia,* growing under varying conditions; some, notably on the dry level at Atsion bog, consisting of but a single low stunted stem, yet covered with a mass of pink flowers. Specimens of the various blueberries and huckleberries were identified, examined, and individual characteristics pointed out. We observed the green stem and pale leaves, fairly large and broad, glaucous underneath, of the late low blueberry, *Vaccinium vacillans,* and the huckleberries, with dots of yellow wax on the underside of their leaves: *Gaylussacia baccata,* the most common; *G. frondosa,* the dangleberry, taller, with its leaf light green. Dr. Wherry pointed out the leaf-like bracts back of each flower of *G. dumosa.* The red coloring of the stamens in this dwarf species is one of its distinctive characteristics; and the name " red stamened huckleberry " coined on the spot by Mrs. Langman, gave a homely and easily remembered identification for *G. dumosa.*

Rivaling the *Kalmia latifolia* in abundance and beauty of bloom were the fragrant white swamp honeysuckle, *Rhododendron viscosum,* and the stagger-bush, *Lyonia mariana.* We saw *R. viscosum* in varying shades—not always white—the unopened flowers especially sometimes being a quite deep pink. Along the Hampton Road we found *R. viscosum* var. *glaucum* growing with the type *R. viscosum.* Seeing the two so close together, the difference between them was easily discernible. Our eyes and attention were forcibly drawn to the paler, glaucous leaves of the variety.

The road into Hampton Bog was one of the loveliest places we visited this day. A single flower head of turkey beard, *Xerophyllum asphodeloides,* brought exclamations of delight. But this was but the outpost of larger clumps which so enchanted us we stopped for closer examination. As we drove further into the woods the white spires became so abundant we no longer exclaimed; from this point on to Batsto River the turkey beard dominated the landscape.

The ditches along the Pine Barrens roads often yield the greatest treasures, passed unnoticed unless sought for. On the moist bank of such a ditch on Hampton Road we found the first thread-leaf sundew, *Drosera filiformis.* Here, too, was the first pitcher plant, *Sarracenia purpurea.* Later, in Atsion bog, Dr. Haas found a beautiful specimen of the latter and pointed out the small bracts, the red sepals which resembled petals, the one dried true petal which was still attached (the others already having dropped), the large green " umbrella " of the style, the absence of stamens which had already disappeared—the little, intimate details on a flower often seen, yet so seldom observed with " eyes that see."

On the Hampton Road we occasionally passed small stands of *Iris prismatica* and stopped at one larger colony to enjoy it leisurely. We walked along through the open woods of pitch pine, *Pinus rigida,* their " candles " pointing to the sky, the tree widely spaced, showing to perfection their irregular outline. Mr. Hand's comment " nothing very formal about these trees " spoke so simply and adequately of their appearance. We passed magnificent stands of Virginia chainfern, *Woodwardia virginica,* and cinnamon fern, *Osmunda cinnamomea,* growing so thickly together it was difficult to tell one from the other until Dr. Wherry pointed out the black stem of the chainfern as a distinguishing feature. Dr. Gordon discovered a large " cookie ", which he passed around for refreshment, the scabrous stemmed Boletus, *Boletus scaber.* Dr. Gordon ate it with great enjoyment; others tried it but admitted it had little taste. Still others, hesitating to trust even a botanist in the matter of mushrooms, refused even a small nibble.

But it was at the end of Hampton Road at Batsto River that the climax of the day was reached. We parked in a dry field so thick with *Lyonia mariana* it was impossible not to crush some of the plants, and walked east from the road where, in the utterly dry sand, was a magnificent floral display: The Pine Barren sandwort, *Arenaria caroliniana,* was at the height of its bloom, and the entire field of sand bordering the stream-side bog was covered with the white stars of these flowers.

In this narrow strip of bog we came to what was for many the botanical highlight of the trip. For here, so hidden in the rank growth of cinnamon fern that it would have gone unnoticed without our leader to find it for us, was that relative of the Curly Grass, the rare climbing fern, *Lygodium palmatum.* We found specimens in all stages of growth, some showing to perfection the peculiar dichotomously branched fruiting frondlets, some showing the dried spore cases of last year, which resembled minute pine cones. We saw the stalk-like fronds twining around the supporting cinnamon fern, carrying their palmately lobed frondlets upward. What photographing here took place! And what patience was needed to provide the proper background and to get the exact position necessary to photograph such small, delicate ferns.

But the day was growing late, and we had still two more stops to make. We turned into Quaker Bridge Road to see an especially interesting bed of the Spurge, *Euphorbia ipecacuanhae,* where there were many plants of the same species, yet no two alike—different leaf colorings and different forms in each plant. We were told these tiny plants had roots that went down for three or more feet.

The last stop was at Atsion bog. Here, at the end of the trip, as we looked over the little spires of the foxtail clubmoss, *Lycopodium alopecuroides,* pointing upward from the bog, how easy it was to let the mind wander, and in imagination enter the age of the giant clubmoss, when the great ancestors of these tiny plants before us reigned supreme on the earth in just such bogs as this. But today the little white puffs of *Eriocaulon decangulare,* the orange of *Polygala lutea,* and the yellow of *Utricularia clandestina* mingle with the inconspicuous *Lycopodium,* and its green is passed unnoticed by the many who rush by.

So we came to the end of this day. Often have we gone to the Pine Barrens, individually and in other groups, but never, I think, have we entered more closely into the intimate life of its wealth of plants.—MARGARET G. BUTLER.

Program of Meetings

Date	*Subject*	*Speaker*	*Attendance*
Jan. 24, 1952	A Study of Ranunculaceae	A. David Hammond	26
Feb. 28	Memorial to Dr. Francis W. Pennell	....	53
Mar. 27	Botanizing with the Okinawans	Egbert H. Walker	34
Apr. 24	A Wild Orchid Pilgrimage	H. P. Sturm	31
May 22	A Study of the Genus Lygodium	Mrs. Elizabeth A. Valentine	24
Sept. 25	Studies in American Azaleas	Henry T. Skinner	35
Oct. 23	Western Wild Flowers	Edwin O. Geckeler	45
Nov. 20	Some Endemic Plants of the Southern Appalachians	Ralph M. Sargent	39
Dec. 18	Further Studies in the Pennsylvania Flora	Edgar T. Wherry	47
Jan. 22, 1953	Exploring in the Rockies	Paul B. Green	40
Feb. 26	A Hobbyist's Kodachrome Photography of Wild Flowers	C. Irwin Stiteler	41
Mar. 26	Relative Merits of Gray's Manual of Botany, Ed. 8, and the New Britton and Brown Illustrated Flora	Edgar T. Wherry Bayard Long Wendell H. Camp	31
Apr. 23	Movements in Plants	David R. Goddard	23
May 28	Wayside Botanizing in Mexico	John M. Fogg, Jr.	77
Sept. 24	Plant Hunting in Honduras with a Color Camera	Theodor P. Haas	38
Oct. 22	Wildflower Portraits in Color	Raymond D. Wood	56
Nov. 19	Wildflowers, Bees and Butterflies	Miss Josephine deN. Henry	70
Dec. 17	The Phlox Family	Edgar T. Wherry	33

List of Officers and Members, 1952–1953

Mrs. J. Norman Henry, *President*
Hugh E. Stone, *Vice President*
Walter M. Benner, *Secretary*
Harry W. Trudell, *Treasurer*
Bayard Long, *Curator*
Edgar T. Wherry, *Editor*

ACTIVE MEMBERS (as of November 1, 1954)

	Elected
Walter Ainsworth, 426 Cross St., Ann Arbor, Mich.	1946
Mrs. F. E. Atkins, 3422 Queen Lane, Philadelphia 29, Pa.	1953
Mr. & Mrs. Chris. H. Baker, 8 Valley View Lane, Newtown Square, Pa.	1954
Mrs. Walter Bancroft, 5321 Wakefield St., Philadelphia 44, Pa.	1954
Mrs. A. C. Barnes, Latch's Lane, Merion, Pa.	1942
Edwin B. Bartram, Bushkill, Pa.	1906
J. Russell Bebler, 6245 Wissahickon Ave., Philadelphia 44, Pa.	1919
Dr. Walter M. Benner, 5636 Loretta Ave., Philadelphia 24, Pa.	1912
Jasper T. Bentley, 201 W. Chestnut Hill Ave., Philadelphia 18, Pa.	1933
Dr. David Berkheimer, Limekiln, Pa.	1943
Carl E. Bliss, R. D. 1, Chagrin Falls, Ohio	1924
Miss Ethel Brubaker, Beach Dale, Bird in Hand, Pa.	1939
William C. Brumbach, Esterly, Pa.	1943

Miss Margaret Butler, 4598 Castor Ave., Philadelphia 24, Pa. 1953
Dr. William W. Cadbury, 274 W. Main St., Moorestown, N. J. 1950
Richard B. Chillas, 233 Winona Ave., Philadelphia 44, Pa. 1942
John W. Coburn, 120 Nippon St., Philadelphia 19, Pa. 1951
Miss Carola Collins, 1728 Pine St., Philadelphia 3, Pa. 1954
W. L. Dix, 801 Crown St., Morrisville, Pa. 1942
Albert Donaghy, 203 E. Wellens St., Philadelphia 20, Pa. 1952
Robert R. Dreisbach, 301 Helen St., Midland, Mich. 1922
Miss Elizabeth C. Earle, 4209 Chester Ave., Philadelphia 4, Pa. 1935
Howard W. Elkinton, 6514 Germantown Ave., Philadelphia 19, Pa. 1931
Mrs. Nellie Erisman, 1821 Mt. Vernon St., Philadelphia 30, Pa. 1945
Mrs. Harold Evans, Awbury, E. Washington Lane, Philadelphia 38, Pa. 1931
Mrs. Richard Evans, 4012 Pine St., Philadelphia 4, Pa. 1953
Carl W. Fenninger, 1632 Chestnut St., Philadelphia 3, Pa. 1947
Albert J. Ferkel, 1101 N. 63rd St., Philadelphia 31, Pa. 1948
Miss Elizabeth H. Flavell, 6146 Wayne Ave., Philadelphia 44, Pa. 1946
Dr. John M. Fogg, Jr., Morris Arboretum, Philadelphia 18, Pa. 1921
Fairman R. Furness, Media, Pa. 1935
Miss Cathrine Fussell, Bettws-y-Coed, Bryn Mawr, Pa. 1954
Miss Elizabeth A. Gest, R. D. 1, Telford, Pa. 1944
John Gill, 2 Linden Ave., Haddonfield, N. J. 1939
Dr. Thomas S. Githens, Cambridge Apartments, Philadelphia 44, Pa. 1945
Dr. Robert B. Gordon, 415 Sharpless St., West Chester, Pa. 1942
Dr. Theodor P. Haas, Phila. College Pharmacy & Science, Phila. 4, Pa. 1946
Louis E. Hand, Natchez Trail, Medford Lakes, Medford, N. J. 1936
Miss Ann Harbison, The Barclay, Rittenhouse Square, Philadelphia 3, Pa. 1944
Alfred J. Hattman, 2138 Bellevue St., Philadelphia 40, Pa. 1952
Mrs. J. Norman Henry, Gladwyne, Pa. 1932
Miss Josephine DeN. Henry, Gladwyne, Pa. 1938
Mr. & Mrs. A. H. Holcombe, Jr., 1330 Youngs Ford Road, Gladwyne, Pa. 1949
Miss Nancy E. James, 4043 Baltimore Ave., Philadelphia 4, Pa. 1942
Prof. Marion A. Johnson, Dept. Botany, Rutgers University, New Brunswick, N. J. ... 1946
Miss Natalie B. Kimber, 538 E. Locust Ave., Philadelphia 44, Pa. 1928
Ludwig A. Koelnau, 159 N. 21st St., Philadelphia 3, Pa. 1952
Mrs. Ida K. Langman, 3509 Baring St., Philadelphia 4, Pa. 1937
Miss Elizabeth H. Lewis, Sedgley Apts., 400 S. 45th St., Philadelphia 4, Pa. 1954
Dr. Hui-Lin Li, Morris Arboretum, Philadelphia 18, Pa. 1944
Dr. Harry A. Lloyd, 200 N. 35th St., Philadelphia 4, Pa. 1931
Bayard Long, 250 Ashbourne Road, Elkins Park, Philadelphia 17, Pa. 1906
Miss Kathryn Lovatt, 5023 Cedar Ave., Philadelphia 43, Pa. 1953
James McClurken, 1623 E. Berks St., Philadelphia 25, Pa. 1953
John R. McIntosh, 304 Winona Ave., Philadelphia 44, Pa. 1945
Dr. Edwin T. Moul, Dept. Botany, Rutgers University, New Brunswick, N. J. 1945
Frederick M. Oldach, 323 Wellesley Road, Philadelphia 19, Pa. 1951
Mrs. George B. Orr, Willowbrook Farm, Paoli, Pa. 1935
Miss Elizabeth G. Ostheimer, Jenkintown, Pa. 1933
Dr. Samuel C. Palmer, 26th & Chestnut Sts., Chester, Pa. 1929
Walter Palmer, Route 16, Media, Pa. 1952
Mrs. Frank Parker, 400 S. 45th St., Philadelphia 4, Pa. 1950
Dr. Ruth Patrick, Academy of Natural Sciences, Philadelphia 3, Pa. 1937

Harold W. Pretz, 123 S. 17th St., Allentown, Pa.	1909
Dr. Charles W. Reimer, Academy of Natural Sciences, Philadelphia 3, Pa.	1953
Mrs. Phillip Q. Roche, Miquon, Pa.	1953
Miss Anne Rowland, Meadowbrook, Pa.	1948
Mrs. Karl Rugart, 612 Bryn Mawr Ave., Penn Valley, Narberth, Pa.	1942
Dr. Ralph M. Sargent, 4 College Circle, Haverford, Pa.	1948
Dr. Robert L. Schaeffer, Jr., 32 N. 8th St., Allentown, Pa.	1938
Dr. J. R. Schramm, Morris Arboretum, Philadelphia 18, Pa.	1937
Dr. C. Earle Smith, Jr., Academy of Natural Sciences, Philadelphia 3, Pa.	1953
Dr. & Mrs. Robert V. Speck, 737 Cedar Ave., Haddonfield, N. J.	1947
Dr. C. I. Stiteler, 507 Welsh St., Chester, Pa.	1945
Hugh E. Stone, Whitehall Apts., Haverford, Pa.	1892
Miss Mary Sullivan, Montgomery Court Apts., Narberth, Pa.	1954
Dr. Robert R. Tatnall, 236 Lancaster Ave., Wynnewood, Pa.	1928
Dr. George S. Tarnowski, 158 Cromwell Ave., Staten Island 4, N. Y.	1950
Mrs. Howard W. Taylor, Monk Road, Gladwyne, Pa.	1952
Horace E. Thompson, 5016 Schuyler St., Philadelphia 44, Pa.	1920
Miss Elizabeth Thorp, 403 S. 41st St., Philadelphia 4, Pa.	1953
Harry Stanton Tillotson, 48B Sellers Ave., Upper Darby, Pa.	1951
R. J. Titherington, 6317 N. Norwood St., Philadelphia 38, Pa.	1942
Harry W. Trudell, 1309 Highland Ave., Abington, Pa.	1915
Mrs. Elizabeth A. Valentine, 3943 Locust St., Philadelphia 4, Pa.	1949
Mrs. J. H. Vance, 148 Montgomery Ave., Bala-Cynwyd, Pa.	1950
Dr. Paul R. Wagner, Ursinus College, Collegeville, Pa.	1935
E. Perot Walker, 511 Lynmere Road, Bryn Mawr, Pa.	1939
Mr. & Mrs. John A. Wallace, Rose Glen Road, Gladwyne, Pa.	1953
Mrs. Marguerite L. Warnke, 142 S. Logan Ave., Audubon, N. J.	1935
Miss Hilda L. Weber, 1020 Earl St., Philadelphia 25, Pa.	1950
Miss Evelyn Wells, Academy of Natural Sciences, Philadelphia 3, Pa.	1947
Robert F. Welsh, 325 Chestnut St., Philadelphia 6, Pa.	1909
Dr. Edgar T. Wherry, Dept. of Botany, University of Pennsylvania, Phila. 4, Pa.	1925
Hans Wilkens, 425 S. 15th St., Reading, Pa.	1928
Miss Elizabeth Wistar, 200 Montgomery Ave., Philadelphia 18, Pa.	1952
William H. Witte, Riegelsville, Pa., R. D.	1898
Howard Wood, Jr., "Aloha," R. D. 1, Conshohocken, Pa.	1944
Miss Mary F. Wright, 231 Winona Ave., Philadelphia 44, Pa.	1928

HONORARY MEMBER

Dr. Edward E. Wildman, 409 E. 2nd St., Moorestown, N. J.	1935

CORRESPONDING MEMBERS

Dr. Elmer D. Merrill, Arnold Arboretum, Jamaica Plain 30, Mass.	1945
Dr. Harold St. John, University of Hawaii, Honolulu, T. H.	1927
Dr. William Randolph Taylor, University of Michigan, Ann Arbor, Mich.	1921
Dr. Campbell E. Waters, Chevy Chase, Washington 15, D. C.	1904
Dr. Heber W. Youngken, Massachusetts College of Pharmacy, Boston, Mass.	1918

MEMBERS RECENTLY DECEASED

John Bright	November 3, 1952
Rev. William U. Kistler	March 4, 1953
Richard Blossom Farley, "Sarobia" Eddington, Pa.	September 10, 1954

Af 73

No. 28 1954-56

BARTONIA

JOURNAL OF THE
PHILADELPHIA BOTANICAL CLUB

CONTENTS

A Century of Botany in America .... C. EARLE SMITH, JR. 1

Our Dwarf Bindweeds .... EDGAR T. WHERRY 32

Notes on Color, Lobing and Freaks in Phlox subulata .... WALTER AINSWORTH 34

Bennett Bog Now a Nature Sanctuary .... E. T. W. 36

Molinia caerulea at Home in Wayne Co., Pa. .... W. L. DIX 37

In Memoriam 38

Philadelphia Botanical Club Records 42

Rec'd 12/57

PUBLISHED BY THE CLUB
ACADEMY OF NATURAL SCIENCES, NINETEENTH AND THE PARKWAY
PHILADELPHIA 3, PA.
Subscription Price, $1.00. Back numbers, $1.00 each.
ISSUED SEPTEMBER 25, 1957

MISSOURI BOTANICAL
RECEIVED
DEC 2 3 1957

BARTONIA

JOURNAL OF THE
PHILADELPHIA BOTANICAL CLUB

No. 28 1954–56

A Century of Botany in America

C. Earle Smith, Jr.
Academy of Natural Sciences of Philadelphia

With the present emphasis in North American botany centered on the problems of cytogenetics, it frequently appears to the younger taxonomist that the knowledge of North American plants is now well circumscribed. Certainly the day when one could walk into the field and find a new species of phanerogam in the northeastern United States has passed. This is not so true for those working in the southeast or in the west. There new taxa still may be discovered; nor does the botanist always need to go into the field to find them. Indeed, some remain unrecognized among the older collections already mounted and in the various herbaria.

Even the taxonomist working on the mechanics of variation within groups of species must depend upon the basis for nomenclature laid by the early botanists. Mass collections and cytological preparations may elucidate the most logical boundaries for species, but the names for the species are largely derived from older work. It is easy to see the utter confusion which would result were there not this unifying historical approach to systematics. Certainly the development and universal acceptance of the type concept and the principle of priority has given botany a lasting basis intelligible to all whose work depends upon plant materials (notwithstanding the shudders of applied scientists and horticulturists when the discovery of an earlier name means a change from a well-known one).

Because of the dependence of taxonomy upon the history of the science, it is particularly important that today's taxonomists recognize the important changes which have come about in the philosophy underlying systematic work. The changes in methods are more apparent, although still obscure to some of the younger workers. In order to fully appreciate today's problems in nomenclature, some knowledge of the development of botany during the period from 1800 to 1900 is essential. It was during this period that the most radical reversals in philosophy occurred.

American Botany Prior to 1800

By way of introduction to the period to be discussed, a brief summary of the early history of American botany is needed. The tropical areas of the Americas were the first to be explored and colonized, principally by the Spanish and Portuguese. Long before the first permanent colony was established in North America, the Portuguese had established trading stations in Brazil by 1500 (Merrill, 1954) which served the shipping route from Lisbon to Goa, India. The Hispanic peoples had a deep interest in the products of the New World (primarily with a view toward profit) and early supported the exploration of large areas. Thus, before 1650 Georg Marcgraf (1610–1644) had gone into northeastern Brazil, Charles Plumier (1646–1704) soon thereafter explored the island of Haiti and some of the Lesser Antilles, and Luis Feuillée (1660–1732) worked in Chile and Peru. We are all acquainted with the botanical studies of Sir Hans Sloane (1660–1753) on Jamaica, and of Patrick Browne (1720–1790) in the West Indies. Carlo Maria de la Condamine (1701–1774) took the botanist José de Jussieu on his notable expedition to the Andes.

Perhaps the most famous of the early Mexican explorers was Francisco Hernandez (d. 1578), Protomédico of the Indies, whose extensive reports were never published in their entirety. Late in the 18th century, concerted effort was made to explore the Spanish-held areas of America when Charles III authorized the expeditions of Ruiz and Pavón to work in Peru, and Sessé and Mociño to work in Mexico. Martín Sessé y Lacasta (d. 1809) headed the latter mission, which began work in 1788. He was soon joined by the Mexican José Mariano Mociño (d. 1819) who was the most active worker of the expedition. As had happened two centuries before, the scientific results of the Mexican expedition were never published during the lifetime of the authors.

All of the exploration in Latin areas of America and in the British West Indies had been instituted primarily with a view toward learning about those plants which were economically important. The tremendous fund of knowledge about the remainder of the plant world in the area was incidental to the major purpose of the explorers, and it is vastly to the credit of these early botanists that they had such a wide interest in the world around them. Because the sponsoring individuals or institutions were European, the collections made during this period returned to Europe, and, in fact, often became the basic material for herbaria which are now world-renowned. Taxonomic work in the New World was impractical as the only bases for comparisons then were the Old World collections and the herbals and other literature which had been written largely to satisfy a practical demand. Frequently the authors had drawn their information from plants in botanical gardens associated with educational institutions and trade societies.

It was to enrich the gardens of Europe, and to discover the economic plants of North America that the earliest collectors were employed in this continent. Some few of these very early botanists may well have been reporting on plants about them in which they were particularly interested. Rev. John Banister (d. *ca.* 1692), one of the early missionaries in Virginia, was instrumental in making the observations recorded in a " Catalogue of Plants Observed in Virginia " published in England by Ray. John Clayton (1686–1773), who came to Virginia in 1705, is well known for his " Flora Virginica " of 1739–43. Most of the contributors to American botany during this period were sent specifically to investigate the plants which might be used in Europe. Mark Catesby (ca. 1679–1749) had visited our shores and was persuaded to return by Sloane and Petiver. His " Natural History of Carolina, Florida and the Bahama Islands " (London, 1731) was the result. Through the interest of Peter Collinson (1674–1768), the first native American botanist, John Bartram (1699–1777), began his famous series of observations and collections, the latter consisting largely of live material destined for the gardens of England, but supported by specimens for identification. In a published letter (Darlington, 1849) of 1735, Collinson gives Bartram detailed instructions for putting up the specimens which were to be sent back once a year in papers furnished by his patron. Bartram assembled much of his material in a " botanic garden " which was probably more in the nature of a holding nursery for maintaining stock until such time as he could make shipments. A relative of Bartram, Humphry Marshall (1722–1801) also established a " botanic garden ", undoubtedly for the same use as that of Bartram, as he too shipped plant material to England. To him goes the credit of having written and published the first wholly American botanical work, " Arbustum Americanum " (Philadelphia, 1785).

Increased interest in botany had developed all along the eastern colonies. As early as 1737, John Brickell, M.D. (fl. 1730–1745) had published a " Natural History of North Carolina ". John Fraser (1750–1811), an English nurseryman who had visited Newfoundland in 1780 to 1784 and the southern states from 1785 to 1796, was instrumental in having Thomas Walter's (d. 1788) " Flora Caroliniana " published. Sweden sent Peter Kalm (1716–1779), a pupil of Linnaeus, on a trip to the Philadelphia area and northward. André Michaux (1746–1802) was sent by the French to collect material for the continental gardens. His " Flora Boreali-Americana " of 1803 was the first attempt at an overall treatment of the plants of North America. Famous nurseries like that of Conrad Loddiges (1743?–1826) stocked plant introductions from the collectors Michaux and Bartram.

This, then, was still an era of exploration sponsored from Europe for the purpose of discovering the useful plants of North America, *i.e.*, useful either economically or esthetically. Many " non-useful " plants were being found in the process, and excellent taxonomic work classifying the collections was the result. But, until this time, roughly the end of the 18th century, all of the material living and dried was passing to the institutions of the Old World. Another thing to be noted at this point is that the herbarium collections were not being made as an end in themselves. This is well pointed up by the previously mentioned letter to John Bartram from Collinson wherein he states, " Thus, when now and then thee observes a curious plant, thee may treat it in this manner, [pressing] by which thee will convey a more lively idea than the best description; and when thee gathers seeds, mark the same number on the seeds as thee marks in the sheets where the specimen is, . . . ". The collection of herbarium specimens for study in themselves was to be a direct outgrowth of the great interest in securing a knowledge of all the parts of the world so recently opened to Europeans.

During this phase of the development of botanical science, the definition of new entities was, and for another half-century would be, carried out under a restrictive theological philosophy. It must be remembered that this period was also a time of awakening religious curiosity; the strong bonds with the great Roman church were broken, and many sects had turned to fundamentalism. While the taxa to be described were many and varied, the problem of individual variation was not seriously considered. It could not be because of an absolute adherence to the book of Genesis of the Bible which stated in essence that God had created the species. Admission of variation and the attendant possibility that such an agency might create new species would be an unpardonable act of heresy. (A few naturalists including Rafinesque had dared to print such ideas, but they were not taken seriously). Thus, taxa which were similar were often placed in one general species whose geographic limits were utterly fantastic in the light of our present knowledge of the mechanics of speciation and geographic distribution. Here, too, is to be laid the blame for the very generalized locality data supplied with collections; New England, Carolina, Canada, or even North America being considered sufficient to designate a sample of an "invariable" species to be found there. This would serve as a basis for comparison for similar material from any part of the continent.

The latter part of the 18th century saw an important development in the history of North American botany. By this time, the foundations for the great comparison collections in Europe had been well laid. The value of these dried samples was established, and the growth of large private collections of herbarium specimens for their own interest and inherent use was assured. Where the Bartrams and the Marshalls had only prepared herbarium specimens for the convenience of their European customers, in identifying the living material which they were sending (the earlier collectors having apparently kept no herbaria for their own use), American botanists were by now starting their own herbaria. Furthermore, they began their own taxonomic studies. Very fortunately, the young American Philosophical Society began to accept collections for a "natural history cabinet," to be consulted by associated scientists. Shortly after the turn of the century (in 1812), the Academy of Natural Sciences of Philadelphia was founded, the specific aim of which was the bringing together of specimens for collections, as well as the scientists who would use them.

By way of review of the geographic area touched by botanical collectors at the beginning of the 19th century, suffice it to say that the coast and river drainages of the South American land mass had been sampled (it is still incompletely collected). The West Indian islands, smaller and with a more restricted flora, were more thoroughly known. Thanks to the Royal Expedition to New Spain, Mexico was being explored, although the publication of the results from these collections was to be delayed. The colonial area along the east coast of North America was more assiduously collected than any other area in the New World. Small collections on the Arctic fringes at Greenland and Labrador had been made, and expeditions had touched the west coast of the North American continent.

American Botany from 1800 to 1900

At this time, Philadelphia assumed its undisputed position as the center of culture in eastern North America. The new United States was to expand both geographically and culturally from this center. And, foremost in the development of Philadelphia as a botanical center was the tradition for local plant collections begun by John and William Bartram. Not far away in Lancaster, Gotthilf Henry Earnest Muhlenberg (1753–1815) had assembled a remarkable collection of both living and dried plants. A pastor largely restricted to his local area, he assembled his material by correspondence with a number of European and American botanists including taxonomists, collectors and nurserymen (who were still furnishing new material for the gardens of the Old World). Among the American nurserymen, Bernard McMahon (fl. 1775–1816), a Philadelphian, and John Lyon (d. 1814), another Philadelphian who travelled widely in the southeast, were well known for their new discoveries. Constantine Samuel Rafinesque (–Schmaltz) (1798–1840) was a professional traveller, and an inveterate describer of new species. By the nature of his occupation as a naval surgeon, William Baldwin (1779–1819) travelled widely, and his keen observations eventually led to his publication of new species of *Rhynchospora*, and to his appointment as botanist on Long's Rocky Mountain expedition.[1] Some of Muhlenberg's friends and correspondents were local botanists who worked intensively within a relatively small area. William Bartram (1739–1823), son of John, the famed botanist to the King, had travelled in the south, but his later years were spent largely in the Philadelphia area. John Brickell (1749?–1809) who settled in Savannah, Georgia, collected in that region for Muhlenberg and others. One of the more famous of the local botanists who collaborated with Muhlenberg was Stephen Elliott (1771–1830) of Charleston, South Carolina, who brought together a herbarium of his own, and published the famous " Sketchbook " (Elliott, 1816). Muhlenberg himself was an industrious collector not only of specimens, but also of observations which he recorded in very cramped handwriting in numerous journals and record books. From the notes and materials which he assembled came the first of the wholly American floristic works " Catalogus plantarum Americae septentrionalis," published in Philadelphia in 1813. Other publications resulting from his work were notes on *Juglans, Fraxinus, Quercus, Salix* and, posthumously, on grasses. He also published a list of the Lancaster, Pennsylvania, flora.

---

[1] In reference to a confusion in collection numbers on the Baldwin specimens in Muhlenberg's herbarium, the following is a sufficiently clear statement taken from a letter from Baldwin to Muhlenberg dated August 7, 1813 (Darlington, 1843), "I beg you will correct a ridiculous mistake in the numbers of my last letter, in which I have made a most preposterous transition from 1099 to 2000 through haste and inadvertence. The numbers contained in the last packet were 1109 to 1178. I now send you 1179–1191."

One of the more important contributions of Henry Muhlenberg and the collectors who belong to his period was their correspondence with European botanists, who, at that time, had charge of the only named collections of American plants with which comparisons could be made. Through these contacts some of Muhlenberg's discoveries were published; while by exchange, much comparison material came to his own herbarium. Muhlenberg was especially interested in cryptogamic plants and assembled a fine collection of them, but the only new species he published were those sent to European authorities. From the fly-leaf of one of the manuscript journals now at the library of the American Philosophical Society comes this list of Muhlenberg correspondents, reproduced as he wrote them;

> C. H. Persoon, Henr. Adolph Schrader, Carl Ludw. Willdenow, B. S. Müller, D. Smith President of the L. S., [and in another hand, Citoyen Palisoto-Beauvois].

Additional correspondents, whose names are taken from the lists of plants in various day books, are Hofman, Hedwig, Schreber and Sprengel.

One of the most talented of the early American botanists was the Moravian churchman, Lewis David von Schweinitz (1780–1834). After receiving his early training in America, Schweinitz was sent to Europe for his higher education. While there, he became associated with Johannes Baptista Albertini (1769–1831), and in 1805, they jointly published " Conspectus fungorum in Lusatiae superioris agro Niskiensi crescentium". Returning to take over a church post in Salem, North Carolina, Schweinitz found time to begin the assembly of one of the most complete of the early private American herbaria, His interest in cryptogams led him to collect these in quantity, but he did not slight the seed plants of the area. His keen observations led to the preparation of a " Flora Salemitana " with descriptions of many new species. This was never published (the manuscript is now in the library of the Academy of Natural Sciences of Philadelphia). He did publish, through Christian Fridrich Schwägrichen (1775–1853), "Synopsis fungorum Carolinae superioris secundum observationes, etc." at Leipzig in 1818. After another work on the cryptogams, "Specimen florae Americae septentrionalis cryptogamicae, etc." (Raleigh, 1821), Schweinitz turned largely to monographs including treatments of *Viola*, *Carex*, and *Sphaeria* (all genera which still occasion difficulty in the eastern United States). He ably identified the plants collected by Thomas Say (1787–1834) on Stephen H. Long's expedition to the source of the St. Peter's River. Finally, in 1831, he published a notable synopsis of American fungi.

As Muhlenberg had done, Schweinitz built his collection largely by correspondence. The volume of this, his carefully executed paintings of fungi, curatorial work with his specimens and the activities connected with his position as American head of the Moravian brotherhood (after his move to Bethlehem, Pennsylvania in 1822) must have left him little time for anything else. Among the American botanists, many were correspondents of both Muhlenberg and Schweinitz. Stephen Elliott and William Baldwin contributed substantially to both herbaria. Moreover, on the death of Baldwin shortly after he had joined Major Long's expedition to the upper Missouri, Schweinitz purchased Baldwin's private collection, adding it to his own. Covering a period somewhat later than Muhlenberg, Schweinitz had among his American botanist friends the two young New York botanists, John Torrey of New York City and Asa Gray of Utica.

Among the European botanists who contributed to his herbarium, Schweinitz lists Agardh, Bentham (then a young man who sent in Pyrenees plants), Brongniart, P. DeCandolle, Fries, Greville, W. J. Hooker, Jacquin, Kunze, Ledebour, Martius, Reichenbach, Schwägrichen, Sprengel, Steudel, Treviranus, Wallich and J. M. Zeyher. Thus, a certain amount of the finest material coming into the European botanical centers found its way to the new collections in North America. Also, the opinions of the European experts must have had a great influence on the work of naming plants in the New World.

This period in the development of American botany saw also the growth of interest among those who contributed the financial incentive for carrying out botanical work. In the Philadelphia area, William Hamilton (1714–1813), owner of "Woodlands", a famous estate on the Schuylkill, became the foremost patron of the collectors of horticultural material. His grounds were reported to have had one of the finest collections of plant material outside of the gardens of Europe. With a more academic interest in botany, Benjamin Smith Barton (1766–1815), professor of materia medica and botany at the University of Pennsylvania, hired two outstanding young botanists and collectors. Frederick Traugott Pursh (1799–1811) worked first for Hamilton, but, under the tutelage of Barton, he came to know the eastern American flora through long collecting trips southward to Carolina and northward to New Hampshire. The collections from the Lewis and Clark expedition of 1804–06 were turned over to Barton who, in turn, entrusted their study to Pursh. Thus, the collections being assembled by Barton with a view to preparation of an American flora were later well utilized by Pursh when he published his "Flora Americae Septentrionalis" (London, 1814) under the patronage of Aylmer Bourke Lambert (1762–1843). Thomas Nuttall (1786–1859) was the second botanist to be benefited by the patronage of Barton. Again, collecting trips, this time into the opening west, were made at the instigation of the patron. Thus two Philadelphia patrons of the early 19th century helped shape the course of taxonomic study of American plants.

At least one Philadelphian of this period left the field of American flora and became an important contributor to the knowledge of Old World botany. Thomas Horsefield (1774–1859) spent sixteen years in Java where he made many collections. He finally settled in London as keeper of the museum of the East India Company.

The private collections assembled by the two most diligent botanists of the Philadelphia area, Muhlenberg and Schweinitz, still exist in the herbarium of the Academy of Natural Sciences. The former is the property of the American Philosophical Society. Another fine herbarium of the period, the Benjamin Smith Barton herbarium, is likewise at the Academy (also the property of the American Philosophical Society). Finally, a portion of the Lambert herbarium including American collections of the period was purchased at the London auction by Edward Tuckerman, Jr. and presented to the Academy herbarium in 1855. In order to understand something of the significance of these specimens, it is necessary to have a knowledge of the philosophy underlying their collection, and the mechanics of the early curating to which they were subjected.

Among the first considerations is the fact that the specimens thus preserved were collected mainly in the search for novelties which, in the early 19th century, was still gathering momentum. No thought was given to geographic distribution or variation within a species. In the first instance, distributional data had little influence on the newness of entities; one specimen could stand for a new species as well as a suite of specimens could. In the second instance, variation was incompatible with a fundamental interpretation of the Bible (as has been mentioned before), and taxonomists were not looking for variation although some of them may have been acutely aware of it. Furthermore, it must be remembered that the science of botanical taxonomy was growing, not as an integrated whole, but in a multitude of directions as diverse as the minds of the many botanists involved. These workers were isolated from one another more widely in time and in space than we are today, even though they may have lived and worked during the same span of years. It is indeed remarkable that botany at this period had achieved as coherent a pattern as we now see in retrospect. The concept of a type specimen had not yet appeared. Any example of a species identified by an expert in the field of world botany stood with as much value as types do today. This may be well illustrated by a citation from DeCandolle's Prodromus (vol. 4, p. 60) under *Hydrocotyle Langsdorfii* where we find " V. S. comm. à cl. Fischer ". Another source of trouble in older work resulted from the preparation of descriptions from garden material; again, an example from the Prodromus (vol. 4, p. 322) under *Sambucus ebulus* L. var. *humilis*, where the specimen is cited " in hortus interdum culta. (v. v.) ". Indeed, authors sometimes gave no indication of having had a specimen at all, for example, *Physalis pubescens* in Pursh's Flora, where he merely states " v. v." leaving the quest for a [type] specimen annotated in Pursh's handwriting up to present-day botanists. There were, moreover, no rules of priority, and botanists, on occasion, renamed species or even genera because the original name was not to their liking.

When we consider the curatorial procedures current during this period, we must again note that the workers had not realized the importance of variation. Many methods of storage for the specimens were used. Paper was expensive, particularly in America. Muhlenberg often brought together all his specimens of a species in a loose fold of paper, or again laid several half sheets of loose specimens representing different species into a single fold. If there were a tag affixed to the stem by a slit, this was left. Sometimes a loose slip was laid on the sheet, probably directly on top of the specimen to which it referred. However, notes in his day books fortunately carried considerable information about Muhlenberg's herbarium specimens. This important collection is only now in the process of being mounted. Some European institutions still use a similar method of storage, although a single specimen is now generally pinned to the fold in which it is stored.

Schweinitz, on the other hand, employed large books to preserve his specimens. The species name was written at the top of the page. All specimens of the species were strip mounted, often one over another when the page became crowded. Because original labels would have taken up much space on the page, they were almost universally discarded, and two cryptic notes were added alongside the specimen, one denoting the general area where the specimen was collected (Sal. for Salem, North Carolina, Can. for Canada, etc.) and the other naming the person who had sent the specimen to Schweinitz. (Hook. for Hooker, Str. for Steinhauer, etc.). Sometimes Schweinitz indicated a secondary source as " Leitn. ex Ludw." for Leitner from Ludwig. The specimens have now been taken from the pages and mounted on herbarium sheets with the Schweinitz notes. Where the specimens were crowded on the page, there is no assurance that the notes pertain to the proper specimen, nor have we any way to ascertain the collector when the donor was obviously another person. In many instances, of course, the donor was also the describer of the species, and the specimen may be an isotype whose authenticity would only be determinable by comparison with the type specimen.

Barton used a combination of the two storage methods, some of his personal collections being mounted in books with the data written on the page, other collections being laid into sheets and kept loose with the label data. These latter specimens have now been mounted on herbarium sheets with supplementary labels adding information which was not apparent on the original label. Here, again, there still remain various mysteries which are gradually being resolved by a careful historical study. Certain of the Pursh types have now been definitely recognized and annotated by Mr. Joseph Ewan and are thus much more easily accessible.

Both the Muhlenberg and Schweinitz herbaria included a quantity of cryptogamic material which is of considerable importance. Both collectors packeted the fungi, mosses, hepatics, and lichens in small slips of paper with notes on the outside. The Schweinitz material has now been largely repacketed (the original packet being placed in a larger one). Unfortunately, many of the original Schweinitz fungi packets had been opened in 1855 to 1857 by Ezra Michener (1794–1887), who divided the specimens, mounted a set for the Academy herbarium with transcribed data, and kept a set for his efforts.[2] Thus, even the Schweinitz notes have frequently been lost from the packets of fungi. The Muhlenberg packets of fungi and lichens have not been reworked except to roughly protet them by enclosure in another fold of paper. Here the data are much more fragmentary, consisting largely of numbers referring back to notes in journals. E. G. Britton carefully examined the mosses in the Muhlenberg herbarium, and they are now well packeted and annotated. There seems to have been little cryptogamic material in the Barton collection.

Philadelphia in the early years of the 19th century was the undisputed center of American botany. The largest and most accurately identified collections of American and Old World plants were here; the herbaria of the Academy and the American Philosophical Society held the bulk of the American collections in the United States. This period saw the beginning of extensive western exploration as the new nation sought to learn about the large undeveloped tracts of land that were being acquired. For identifiers as well as for collectors, the government turned to Philadelphia. The Long expeditions to the Great Lakes region and westward to the Rocky Mountains were staffed in part by scientists from the Philadelphia area. Schweinitz's part in identifying Say's plant collections, and Pursh's connection with the Lewis and Clark collections have already been mentioned. Nuttall worked in the Academy herbarium off and on until about 1840. During this period he concentrated on his own collections, placing duplicates in the herbarium as well as specimens of foreign material which he had apparently received by exchange. The entire Schweinitz herbarium including the Baldwin plants came to the Academy in 1834. Charles Pickering (1805–1878) contributed much to the Academy's growth. Dr. John Torrey (1796–1873) was a frequent visitor, working with Nuttall and consulting the specimens in the herbarium. The Academy herbarium was growing rapidly now because it was recognized as the outstanding American collection. Specimens of Arctic plants from W. E. Parry's northern trips, Canadian plants from the Franklin expeditions, Poiteau plants from Haiti, La Sagra collections from Cuba, and others filled out the northern and southern American representation. Collections from Pitcher in Arkansas and from Tainturier in Louisiana supplemented the mid-western material.

---

[2] Michener was not the first mycologist to raid the Schweinitz collection. M. A. Curtis had visited the Academy in 1851 at which time he acquired Schweinitz specimens sometimes sufficiently large to divide with his co-worker, Berkeley, in England, and with the younger Fries in Sweden. Again, in 1853, Henry W. Ravenel (1814–1872) visited Philadelphia, and took away with him portions of "near 150 authentic species" of the Schweinitz herbarium of fungi.

This growth was to continue more slowly after the care of the collections passed into other hands. The bases for the study of the material were the philosophies previously noted. New species seemed to be one of the prime requisites of a collection. Thus, in 1831, Torrey wrote to Schweinitz (Shear and Stevens, 1921), " During my stay at Princeton I was diligent in collecting plants, but my research for new species was not successful ". Furthermore, the donor of the material was frequently considered to be more important than the collector. In a letter to Torrey in 1832 (Shear and Stevens, *op. cit.*) Schweinitz states, " In the labels which I shall give those [specimens] you wish—I will carefully note the place & the source [donor] from which I have derived them."

After 1840, the curatorship of the Academy herbarium passed into the hands of Elias Durand (1794–1873). While he was an amateur botanist, he had sufficient experience to publish several papers on collections coming to the Academy (Durand 1855 and 1860). His limited viewpoint in regard to curating the collections is much to be regretted. Pennell (1935 and 1944) has amply told of Durand's shortsightedness in picking out from the Academy's bundles a single specimen of each species for the working comparison set of the " Herbarium Boreali Americanum ", and his assignment of " duplicates " (that is, other specimens of the same species, *not* our understanding of duplicates) to be used for exchange. His relegation of the Rafinesque herbarium to the trash heap was probably one of the most reprehensible acts which he committed. Other infringements on currently acceptable methods were his selection of Nuttall's specimens for Asa Gray (who had by then become the leading American botanist and, in Durand's opinion, the proper owner for this material), and the mixing of many specimens in Short's tropical American collection on single sheets out of the bundles in which they had been stored. In line with the general carelessness concerning the important collections in his care, Durand allowed a succession of visiting mycologists to divide the specimens of the Schweinitz collection so that fragments are now scattered in the Michener collection in Washington, the Fries herbarium at Uppsala, the Curtis material at the Farlow Herbarium in Cambridge, the Berkeley collection at Kew, and the Ravenel material at the British Museum. (See footnote on page 10).

Under Durand, the philosophy of the invariability of the species reached its peak in Philadelphia. The many thousands of specimens stored in bundles in the Academy herbarium were loosely handled (the single specimen of each species in Durand's Herbarium Boreali Americanum was all he considered needful for comprehensive botanical work). As a result, much difficulty is experienced by present-day botanists in trying to find authentic specimens in the collection. Two recent instances come to mind. In the first, a request to look for a Sitgreaves collection of *Lupinus* was filled by the loan of a sheet with two fragments accompanied by an appropriate Sitgreaves label. The monographer wrote back, " I was amazed at the plants and I still am. I hadn't expected either of the two on the sheet to be within several hundred miles." Later, he wrote, ". . . I believe that the explanation lies in the label of Aubrey Smith's [a third specimen on the sheet] in which there is some confusion at crossing out two of the states above and then erroneously writing in the wrong one below." Thus, the Sitgreaves Arizona specimens are apparently lost, and the labels really applied to specimens of A. Smith's California collection!

The second case, involving Nuttall material of *Helenium*, is stated in a letter from the monographer thus, " The first sheet bears a cut-out and pasted-on label of Nuttall's in his manner of designating a new species, and the label reads *L.* [*Leptopoda*] **denticulata* Nutt. . . . . This specimen is not *denticulata* and I feel Nuttall would be the first to agree . . . ." Here, another case of scattered specimens and mismated labels has been found. In Durand's time, since all specimens of the same species were considerd to be equal, such mixing of data seemed unimportant. It was not until John H. Redfield (1815–1895) took over the management of the Academy herbarium that the job of mounting the specimens was begun, and the collection reactivated, this time under an entirely different philosophy, as we shall see later.

The period during which Philadelphia flourished as the center of American botany was still a time of exploration and collection for the European botanists. This was to continue for many years, although the emphasis on collection would turn northward and westward. It is interesting to note that Nuttall was sending live plant material to England and, in 1813, a catalogue of his plant importations was published listing 89 species at the Fraser Nursery in London.[3]

---

[3] In line with the recent controversy concerning the plant names listed in the Fraser Catalogue and their authorship, I would like to once again emphasize that American botany had its roots in horticultural collections. Taxonomic botany was a side development which, fortunately, was followed by a group of men who were scholarly, but nevertheless were individuals, each with their own ideas of nomenclatural priority and professional ethics. Much in the manner of the merchandisers of today, business men undoubtedly drew together hasty lists of their wares, and the idea of emphasizing new species as a sales " gimmick " must have occurred to them. Also, because Nuttall was involved in the collection of horticultural material, it is not extraordinary that he might have supplied the names for the Fraser list (obviously intended for sales promotion and not as a scientific publication) as an aid to a friend and customer. This in no way reflects on Nuttall's ethics and integrity as a taxonomist, inasmuch as the philosophical aspects of taxonomy were not yet agreed upon and codified by the working botanists. Nuttall may well have written the entire " blurb ", but this cannot

Previously, Archibald Menzies (1754–1842) had been one of the first collectors along the Pacific coast of North America. Francois André Michaux (1770–1856), son of the famous French collector, was sent to America to study the trees, resulting in his "Forest trees of North America". John Bradbury (1768–1823), collector for the Liverpool Botanic Garden, met Nuttall at St. Louis in 1811. From 1817 to 1820, John Goldie was in America, followed soon after by Thomas Drummond on the second Franklin Expedition in 1825–28. Drummond returned after 1831, partly at the suggestion of Torrey, and collected for the Glasgow Garden. David Douglas (1799–1834) was in North America on the west coast from about 1825–1833, collecting for the Royal Horticultural Society. Thereafter, the list of explorers in the west rapidly enlarged. English collectors, alone, searching for both botanical specimens and horticultural material, include John Scouler (1804–1871), Thomas Coulter (1793–1843), Carl Theodor Hartweg (1812–1871), David Lyall (1817–1895) and William Lorb (1809–1863). The last-named collector was sent out by the famous Veitch Nursery.

During this early period in American botany, another aspect developed as the local workers became more confident of the determinations available through correspondence with botanists in the centers at Philadelphia and New York. In 1811, John Eaton LeConte (1784–1860) published a catalogue of the plants of New York followed shortly after by Jacob Bigelow's (1787–1879) "Florula Bostoniensis", perhaps the first wholly American local flora. Previously, local floras had their basis in work done in Europe on the collections from individual American areas. There then followed a host of local floras and lists covering much of the eastern area; W. P. C. Barton's "Philadelphia Flora" (1818), J. A. Brereton's "Prodromus Florae Columbianae" (1830), C. W. Short's "Florula Lexingtoniensis" (1830), and many others. In themselves, such floras had very little taxonomic significance, but they served as useful guides to the plants of special areas. Perhaps their most important impact on American botany lay in the manner in which they pointed out the patterns of distribution of individual taxa. Further, specimens sent by the local botanists to the larger herbaria for identification or confirmation added greatly to the scope of these collections, even though some curators were to temporarily store them away and depend

---

be proven without his own statement to this effect. There is one piece of proof which has been overlooked indicating that Nuttall used at least one of these names apart from his published taxonomic work. Of the material listed in the Fraser Catalogue, the Academy of Natural Sciences Lambert series provides specimens for the following: 1. *Allium reticulatum;* 2. *Allium stellatum;* 4. *Amorpha canescens;* 6. *Astragalus crassicarpus;* 20. *Calymenia pilosa;* 28. *Dracocephalum cuspidatum;* 32. *Evolvulus sessiliflorus;* 40. *Hypericum surculosum;* 54. *Oenothera albicaulis;* 55. *Oenothera serrulata;* 62. *Pycnanthemum dichotomum.* These names and several variations of the notation "Fraser's cat: (or catal:) of Nuttalls Plants" are written on the sheets in A. B. Lambert's hand. On one sheet (40. *Hypericum surculosum*) the upper right hand corner bears the name in Nuttall's script written on a piece of paper much coarser than the Lambert herbarium paper. This may well have been cut from the folder in which Lambert received the specimen. However, even though Nuttall may have been the author of the names, the Fraser list was obviously not intended as a permanent publication. Therefore, unless the names have been subsequently validated, and used, why accord them any more attention than we now give to horticultural listings?

upon a single sample for comparative work. The constant inflow of minor variants from local areas must also have emphasized the violations of the supposed principle of species–invariability for such workers as Torrey.

When Nuttall and Pickering left the Philadelphia area, the center of American botanical activity shifted about 1840 to New York, where Torrey had gained prominence as the outstanding American systematist. Torrey had begun, in 1824, his " Flora of the northern and middle sections of the United States " following the Linnean system. However, he must have fully subscribed to the ideas on classification expounded by John Lindley in the "Introduction to the natural system of botany " (London, 1830) for he promptly set about preparing an American edition of this, for which Schweinitz was asked to furnish a list of fungi. This edition appeared in 1831 and Torrey presented a copy to Schweinitz, but the change to a new system must have been difficult for the older man, as he left his collection in the Linnean arrangement. In spite of his comment to Torrey in a letter of March 29, 1832 (Shear and Stevens, *op. cit.*), " I fairly devoured it ", Schweinitz's copy of Lindley remained uncut until 1953, when the present author cut it in order to get at the introductory pages. Thus, with the center of taxonomic botany swinging to the northward, a change in viewpoint regarding systematics was also coming about. Torrey now became one of the most sought after botanists in the Americas, being entrusted with the identification of material from the numerous expeditions sampling the vast western area. In 1833, he hired Dr. Asa Gray of Utica, New York to assist him in his scientific work, thus beginning the collaboration which was to give such a coherent pattern to the further development of American botanical taxonomy.

Torrey continued in the earlier tradition of acquiring material and opinions by exchange with the botanical specialists in the Old World. He was in active touch with all of the well-known workers both in cryptogams and phanerogams, including such authorities as W. J. Hooker, Greville, Sprengel, DeCandolle, and Martius. His contacts with numerous local American botanists greatly enriched his collection and, also, his understanding of the American flora. These included William Oakes (1799–1848) collecting in New England, Abraham Halsey (1790–1857) around the New York area, William Prince (1766–1842) of Long Island, whose garden was stocked with living material of American plants, Lewis Caleb Beck (1798–1853) of Albany and Missouri, J. E. LeConte who collected on Long Island and around his family residence in Georgia, William Darlington (1782–1863) of West Chester, Pennsylvania, Moses Ashley Curtis (1808–1872) of Hillsboro, North Carolina, who was primarily a mycologist, Charles W. Short (1794–1862) of Lexington and Louisville, Kentucky, and Increase Allen Lapham (1811–1875) of Milwaukee, Wisconsin Territory. These collectors and many others were furnishing the evidence for the distributional limits of American plants, but, of far more significance, they were providing examples illustrating species variability. That this variation was apparent to Torrey, and indeed caused him considerable worry, is amply recorded in his correspondence, and in the lengthy notes and queries often included with specimens.

There had emerged in American taxonomy specialists in groups, for example, Chester Dewey (1784–1867) working almost exclusively on *Carex*, and Joseph Barrett (1796–1882) studying the genus *Salix*. Such workers must also have emphasized the variation to be observed both in the delineation of new species which seemed too finely drawn to Torrey, or in the species complexes drawn with over-extended limits of variation. However, the major effort in taxonomy was still directed to the recording of new species from the many collections pouring in from the west.

One of the most opportune developments in American botany was the founding of publication media wherein results could be placed on record within a reasonable length of time, and made readily available to fellow workers. In the early days of American botany, the native botanists were at a distinct disadvantage when compared with their fellows in Europe as no regular media of publication were open to them. Many of the early species recognized by the workers in the New World became known only through a liason arrangement where the American sent his material and manuscript to be subjected to the editorship of an Old World authority before being published. Much of Muhlenberg's work in cryptogams was thus treated. When an American author decided on local publication, he had to make his own arrangements for printing, oversee the composition, and pay for the run from his own funds with little expectancy of immediate profit (if any profit at all were forthcoming). Productive people like Muhlenberg had much material in manuscript which could never be published from lack of outlets and finances. The new publications of the American Philosophical Society and the Academy of Natural Sciences partially filled the need. Torrey, himself, helped organize the New York Lyceum of Natural History whose publications furnished a still further outlet. Benjamin Silliman (1779–1864) had founded in 1818 the "American Journal of Science and Arts" which provided a convenient serial medium for the publication of papers. It was only with these publication outlets that American botany could develop at an accelerated pace, for the large volume of work done by Torrey would probably have been largely lost if it had had to depend upon private publication. Much of the botanical results of official government expeditions were now appearing as appendices to reports printed at public expense, providing a still further outlet and wide distribution for the results of the researches of American botanists.

Torrey had early become involved in the identification of collections being returned to the east from the many expeditions. David Bates Douglass (1790–1849) had collected plants while on the Cass expedition around the upper Great Lakes region which were identified and reported on by Torrey in 1821. Dr.

Edwin P. James (1797–1861) collected in the Rocky Mountains and his specimens were published upon by Torrey in 1823, 1824, and 1828. The last paper, "Some account of a collection of plants made during a journey to and from the Rocky Mountains, in the summer of 1820, by Edwin P. James, M.D., Assistant Surgeon, U. S. Army," was the first American memoir arranged according to the Natural System. We have already mentioned Torrey's ready acceptance of Lindley's revision of the Linnean system into a more logical arrangement of groups. In 1838, Torrey and his young assistant, Asa Gray, published the first part of the "Flora of North America" which started to treat the region westward to the Mississippi, but the flood of material from the western explorations overtook it. Drummond's Texas collections and Douglas' and Nuttall's California collections were added for consideration. By the time that the third volume appeared in 1843, the flood had grown to such tremendous proportions that it became impractical to attempt further work on an overall flora, In 1843, as New York state botanist, Torrey also published a flora of this state. Carl Geyer (1809–1853) had collected plants on the surveys conducted by Joseph Nicholas Nicollet (1786–1843) in 1836–1840. Torrey published on these in 1843. Thereafter, report after report carried Torrey's signature as botanical authority. These included plants from Fremont, Emory, Stansbury, Marcy, Sitgreaves, Pope, Beckwith, Gunnison, Whipple, Williamson, Parkes, Wilkes (Pacific coast plants), and the railroad survey collections. One of the most voluminous reports was that of the Mexican Boundary Survey on which Parry, Wright, Bigelow, Schott and Thurber were employed as collectors. The last of the expedition reports, the botanical part of which was prepared principally by Torrey, was the Ives report on the Colorado River.

During this period, another botanist by avocation (Torrey had begun his career as a medical doctor and professor of chemistry) deserves special mention because of his intensive study of difficult groups and his interest in promoting the collection of plants from less well known areas. A doctor with a large practice, George Engelmann (1809–1884) devoted his small amount of leisure time to the study of plants. His interest in western botany led Engelmann into treatments of *Cuscuta, Juncus, Cactaceae,* conifers, *Agave, Yucca,* and other groups. He was a frequent collaborator with Torrey and Gray on the identification of survey material. In addition, he took an active interest in stimulating the collections of botanists like Lindheimer. His herbarium became the basis for the collection at the Missouri Botanical Garden. While he did not devote full time to botany, he was responsible, in large part, for stimulating interest in a knowledge of western plants and he contributed materially to the ideas expressed in the work of the eastern botanists.

It is to be emphasized that the whole viewpoint of the mid 19th century American botanists was flavored by the continuing search for new entities which had been started in the 17th century by the collectors from Europe. The exploration was now being conducted by Americans; the taxonomy was being worked out by American botanists; even more important, the prime collections of specimens were remaining in the New World, frequently in private herbaria, but nevertheless within easy reach of the critical workers. The emphasis in the collections had now definitely turned from the discovery of horticultural novelties to the accurate classification of the plants being discovered. Government-sponsored surveys had replaced the earlier individual plant explorations to a large extent, although European nurseries and gardens had some collectors in North America until late in the 19th century. For these collectors, however, the American flora was being abandoned in favor of horticultaural material from temperate Asia and greenhouse plants from the American tropics. In essence, the philosophy implying that horticultural botany carried a certain taint was developing in American institutions and the taxonomists in the "classic" tradition were adhering more strictly to a study of wild material only. From the viewpoint of Federally sponsored collection and identification this seemed to be imperative, as the purpose of the surveys lay in a general evaluation of the natural products of the large western area rather than in the esthetic qualities of the plants.

The basic species concept remained essentially the same for Torrey during his most productive years, although Lindley's system had been fully accepted by him, and the individual variations within a species had obviously been noted. For most of the botanists of this period in the 19th century, the pressure for practical taxonomy, the naming of collections, was too great to allow much deliberation on theoretical concepts of speciation.

One of the most interesting governmental undertakings of the period was the Wilkes expedition manned by naval personnel accompanied by a scientific corps which included three botanists. Charles Wilkes (1798–1877) became commander of the expedition essentially by default. He later proved to be an invaluable ally of the scientists by insisting that the work on the reports be continued in as near the original plan as possible, forestalling curtailment of the publications, although he was inclined to dictate policy much to the scientists disgust. Charles Pickering, William Rich and William D. Brackenridge were the botanists participating in the collecting. Subsequently, portions of the identifications were made and reports written by Torrey, Gray, Bailey and Harvey, Curtis and Berkeley, Sullivant, and Tuckerman. While the undertaking had so many delays in starting, and the reports were never completely published, the Wilkes expedition proved that the United States had evolved a group of able scientists who need no longer be dependent upon Europe for guidance.

In 1842, Asa Gray, associate and friend of Torrey, was appointed to the Fisher professorship at Harvard College. His duties there involved a course of lectures and the care of the Harvard Botanic Garden, one of the first real botanical gardens in the United States. Fortunately for the course of botany in New England, John Amory Lowell (1798–1881) became an outstanding patron, influencing the science through the people he brought to the area for the Lowell lectures and the collections arriving through his subscriptions. The founding of the Lawrence Scientific School was to be another factor in making Cambridge the new center of American science. Botany, though, was to center primarily around Asa Gray. As the close associate of Torrey, he became the next authority to identify the materials arriving in a full flood from the western explorations. He had started his botanical career in the flora of upper New York state, where his early training was in medicine. During the period prior to his move to Cambridge, he had made exsiccati sets of plants from the east, monographed *Rhynchospora* and *Melanthium* and had gained much floristic experience from his association with Torrey. Unlike Torrey, Gray was a man of more catholic botanical interests. To resolve some of the problems in eastern American botany, Gray had gone to the European collections in 1838 and 1839 to make comparisons and notes. He became widely acquainted in Europe where the Hookers, Bentham, Decaisne, and many others found Gray a sharp observer and capable worker. From this he became interested in the history and background of the science. He authored a " Botanical Text-book " for students, and, later, " First Lessons in Botany ". His general knowledge included physiology, anatomy and morphology. He became the first prominent American botanist to work with collections made outside of the North American continent. He had been offered the post of botanist with the Wilkes expedition, but had resigned because of the delays. He, however, worked over much of the Wilkes plant material. This, in turn, led him into plant geography and the problems of distribution in a way never apparent in the work of his old friend Torrey. His paper comparing the floras of Japan and the United States appeared in 1846.

By 1850 American botany was destined to be centered in Cambridge, leaving behind the old Philadelphia Academy herbarium in the hands of Elias Durand, and the work of Torrey in New York. We have seen how the former was being curated through a strict scriptural creation interpretation of the species unit; while Torrey's work had a provincial flavor dealing almost exclusively with the delineation of new American species. This is not to imply that Gray would not respond to the lure of new discoveries. That he was still involved in the primary task of providing pigeon-holes for the American flora is amply proven by the many names authored by him. In Gray's hands, however, American botany was to be given an opportunity for lateral expansion which had been denied under the older concepts.

Gray was to become the leader of a rapidly evolving science in which philosophical concepts would be radically changed. The accumulation of collections had now pointed up the need for more precise distributional data and therefore, better locality data with the specimens. While Durand was still maintaining a herbarium in bundles and filing a single species representative with inadequate locality labels in a North American series, Gray was mounting material with the original data to avoid its loss. Perhaps as a final remnant of the older philosophy, many small specimens supposedly of the same species were fastened to the same sheet, posing a later curatorial problem when they must needs be separated, but they at least retained their identity as to collector and locality. Unfortunately, even Gray confused data to some extent, as he frequently assigned arbitrary numbers to collections of the same species from different localities as a convenience in distributing sets of material. For example, we have Gray's own statement in the foreword to Plantae Wrightianae, p. 6: " The numbers prefixed to the names are those under which the specimens are distributed.", and on page 7, under number 1, the citation reads, " Bluffs of the Rio San Felipe, July; also in the pass of the Limpia, in valleys between the mountains, Aug.; in fruit.".

An even more fundamental philosophical change was to be accepted and supported by Gray. In his " First Lessons in Botany " of 1857, in a footnote on page 195, he states, writing of a system of classification, " It is often obliged to make arbitrary divisions where Nature shows only transitions, and to consider genera etc. as equal units, or groups of equally related species, while in fact they may be very unequal, . . . to assume on paper at least, a strictly definite limitation of genera, of tribes, and of orders, although observation shows so much blending here and there of natural groups, sufficiently distinct on the whole, as to warrant us in assuming the likelihood that the Creator's plan is one of *gradation not of definite limitation,* except as to the species themselves." In 1859, Charles Darwin (1809–1882) published " Origin of Species " which was to split natural science into two camps. Gray was a correspondent of Darwin and thoroughly supported his views. As established leader of American botany, his was a strong position, enabling him to shake free of the older Biblical concept of unit creation, and to lead the American botanical school into a new understanding of variation. He could now apply the concept of " gradation " to the species as well as the higher units, providing a more realistic interpretation of the taxa with which he was working. In actual practice, though, it has been only with the increased knowledge of the mechanisms of variation since Gray's time that the concept has been successfully applied to the delimitation of species.

The center of American botany remained in Cambridge during the lifetime of Gray. Until his death in 1888, he continued to publish voluminously on new collections of plants from western North America as well as from areas outside of the Americas. His widespread interests continued in other aspects of botany, for he published on nomenclature, elementary botany, physiology, pollination, and plant geography. His early acquaintance with the European botanists continued as correspondence and exchange, enriching his herbarium much as had been those of Muhlenberg, Schweinitz and Torrey. And, much in the manner of Torrey, Gray had trained assistants who became eminent botanists in their own right, carrying on some of the principles acquired from their teacher. Sereno Watson (1826–1892) was to carry on in Cambridge, identifying new collections and revising the taxonomy of numerous plant groups with much of the same insight into the problems of the opening west as had characterized Gray's work. William Gilson Farlow (1844–1919) gained an overall interest in botany from Gray's teaching. He specialized on the cryptogamic plants, having gone to Europe for post-graduate training. Returning to Cambridge, he accomplished for his specialty what Gray was doing for phanerogamic botany.

Several of Gray's students, developing an interest in areas of botany apart from taxonomy, were to take the lead in enlarging the scope of American botany. Charles Edwin Bessey (1845–1915) was one of these. While he knew the fundamentals of taxonomy, his interests were in other aspects of botany brought to his notice by Gray. The fields of morphology, anatomy and physiology had been opening in Europe while Americans were still engaged in a headlong rush to catalogue the flora of the country west of the Mississippi. Bessey and others of his time met the new situation by incorporating the new facies of botany into the instruction they were offering at several of the American colleges. In a sense, then, Gray served as a turning point in American botany around whom the science was to open into new fields, as well as the champion of a new concept of the species based upon the gradual derivation of new forms by evolution.

Taxonomic botany was to continue during the latter part of the 19th century in the primary phase of exploration for new species. Canada had its John Macoun (1831–1920)), while the western United States was replete with collectors both in and out of government service. Some of these such as John White Chickering (1931–1913), George Thurber (1821–1890), George Vasey (1822–1893), Julien Reverchon (1837?–1905), and Samuel Botsford Buckley (1809–1884) collected primarily within the United States. Many of these men contributed more than just specimens, functioning also in administrative capacities. Still another group extended their explorations south into Mexico, completing the distribution records for many southwestern species and adding further to the knowledge of the flora of North America. Jean Louis Berlandier (d. 1851), Edward Palmer (1831–1911), Charles Christopher Parry (1823–1890), and Cyrus Gurnsey Pringle (1838–1911) were among these. Several explored in the

American tropics; John Donnell Smith (1829–1928), Augustus Fendler (1813–1883), and Charles Wright (1811–1885) belong in this group. Gray's widespread interests led him to sponsor Wright in his extensive foreign collection program.

Subsequent to the days of Schweinitz and Torrey, more emphasis had been laid on the seed plants than on the lower groups. Study did not entirely languish, but it was not until the middle of the century that new interest in the cryptogams resulted in increased work in this field. William Starling Sullivant (1803–1873) in mosses and Edward Tuckerman, Jr. (1817–1886) in lichens were leaders in their fields, and pioneered the study of these groups in the United States. Sullivant hired Leo Lesquereux (1806–1889) as an assistant to establish the well-known team, which was duly augmented by Thomas Potts James (1804–1882). The fungi and algae of the Wilkes Expedition were farmed out partially to Europe because of lack of comparison material and specialists in the United States. Miles Joseph Berkeley (1803–1889) of England worked with Moses A. Curtis on the fungi in a cooperative effort, which foreshadowed many other joint papers on fungi collected by American botanists. William Henry Harvey (1811–1866) of England worked with Jacob Whitman Bailey (1811–1857) on the algae. Farlow at Harvard was to lay the foundations for one of America's large cryptogamic herbaria.

Lesquereux was interested not only in the mosses of America. The treatment of fossil plant remains had long been relegated to chance observers whose casual reports provided no real basis for scientific investigation. Lesquereux stepped into this void to become the foremost authority on American paleobotany. The geologists of the western surveys turned quantities of material over to him, enabling Lesquereux to lay the lines for comparative studies with recent plants as well as the fossil floras of various ages. Others such as John Strong Newberry (1822–1892) rose to prominence in the field, but Lesquereux's close association with Gray gave him an advantage as he was able to observe the growth of Darwin's theory at first hand, and thus, more thoroughly understand the material which he was studying.

The ferns, too, became the focus of special study for the first time in the history of American botany. George Edward Davenport (1833–1907) and Daniel Cady Eaton (1834–1895) devoted the larger part of their time to the study of the lower vascular plants. Davenport assembled a notable fern herbarium, collected, however, primarily in accord with the older tradition of nomenclatural records rather than the newer ideas on distribution and variation.

The local botanists were also active during the Gray period. Many of them filled the spaces in the herbarium left by the crisscrossing trails of the survey parties, for local botanists were now represented throughout the United States. George William Clinton (1807–1885) of Buffalo, New York and Joseph Hinson Mellichamp (1829–1903) of South Carolina restricted their activities rather severely to small areas. Others worked on a state-wide basis, producing local floras for a wider area, and serving as supply agents for the needs of the workers in the large herbaria. Charles Theodore Mohr (1824–1901) and Augustin Gattinger (1825–1903) worked at this level, filling a valuable position in detailing ecological preferences and minute distributional limits not apparent in the mere lines collected across large areas by itinerant field parties. Still a third group of specialists worked on the botany of the United States on a regional basis. Torrey and Gray had started on the northeastern states primarily because there were insufficient collections from other areas in America to warrant greater scope. Gray continued his interest here, producing the famous " Manual " now in its eighth edition. The real pioneer in regional floras was Alvan Wentworth Chapman (1809–1899) who produced a flora for the southeast before extensive collections had been made. A botanical pioneer in northwestern Florida, Chapman had to do much of the field work himself before he could produce his flora. Thomas Howell (1842–1912) was in a somewhat more advantageous position to write his northwestern flora as explorations had partially covered the far northwest. John Merle Coulter (1851–1928) had participated in the exploration of the Rocky Mountain area. With Thomas C. Porter, he had published a synopsis of the Colorado flora. Building on this, he published the " Manual of the Botany of the Rocky Mountain Region " in 1885.

Toward the end of the century, the science of botany in America began to break away from the influence of any one person or institution. The United States had been particularly fortunate in that the early leaders in botany had been men with broad backgrounds able and willing to accept new ideas and the expansion of the science beyond their immediate aims. While specifically centered, botany had progressed rapidly along a central theme of exploratory taxonomy. As the pattern of collecting began to alter, the number of taxonomists working in systematics grew. Each maintained his own working herbarium. From these expanding collections came the diffusion of botanical effort away from one center. The Smithsonian Institution had been founded in 1846. It housed a collection which had little active use. The migrations of the plants from the Wilkes Expedition have been well catalogued. Even such a nucleus did not early lead to the establishment of an active taxonomic group in Washington.

In 1870, the Arnold Arboretum became a part of the Harvard University botanical empire, adding another facet to the taxonomic work under way at the Gray and Farlow herbaria and the experimental work of Goodale of the Botanical Museum. Charles Sprague Sargent (1841–1927) gave the initial impetus to the new collection of living woody material with its accompanying herbarium. The Arnold Arboretum soon became the American focal point for exploration for horticultural material. As the horticultural horizon had now shifted toward Asia, the new institution developed into the American leader in temperate Old World botany, progressing from living plants to specimens on which identifications could be based, much as botany had begun in America more than one hundred years before.

The last decade saw the final dissolution of any central repository for American botanical collections. The collections of Engelmann became a part of the Shaw Garden at St. Louis, a project modeled after Kew Gardens in England. William Trelease (1857–1945) successfully took charge of the collections and taxonomic work. During the 1890's three large institutions had their start. The United States National Herbarium finally became a true national repository and center for government-sponsored taxonomic research. Nathaniel Lord Britton (1859–1934) was one of the founders of the New York Botanical Garden which, by arrangement with Columbia University, took over the care of the Torrey herbarium and taxonomic work in the New York area. The Field Columbian Museum was established in 1894 as a permanent memorial to the Chicago Exposition, receiving its first collections from the exhibits sent from all over the world.

With the diffusion of taxonomy into many areas, there arose the inevitable clashes of opinion. While Rafinesque had been the rebel of early American botany, he had been accorded little recognition, and he has left his mark primarily in nomenclatural muddles occasioned by the short-sighted destruction of many of his specimens. As Gray relinquished his place at the head of botanical taxonomy, Edward Lee Greene (1843–1915) became the renegade botanist who needled the more staid taxonomists working on the identification of western plants. From a fund of field observations and an adherence to an older species concept, Greene progressed to species naming with little reference to the overall relationships involved and without much insight into the processes by which the species had come about. His place in American botany is important not so much because of the validity of his species (these have frequently proven to be infraspecific variants) but because he and other individualists brought about a keen self-inspection by the classical taxonomists. The darts of Greene could only logically be turned by the weight of studied fact, not by emotional answers. Another of the individualists was Marcus Eugene Jones (1852–1934) whose botanical efforts were of higher calibre than those of Greene. By his sharp criticism of the work of others, he drew much fire, but, like Greene, he became a needle to prick the conscience of many coworkers. Needless to say, he and Greene were almost diametrically opposed in their contributions to the progress of western botany.

Another change was occurring in American botany. DeCandolle had drawn up a set of rules governing botanical nomenclature for presentation to the congress meeting at Paris in 1867. The American botanists were not represented, and portions of the rules were not acceptable to them. The leadership of Britton in botanical nomenclature to America resulted in the adoption of the "American" code at Rochester in the later years of the 19th century. The American group favored a strict priority and the designation of types. For the first time in American botany all of the workers in the field of taxonomy had a set procedure to follow in relegating names to synonomy and in fixing the identity of new species. So long as the problems of nomenclature had passed through one central figure, first Torrey and, later, Gray, a coherent pattern was possible. When the number of institutions and botanists became too large to look to a single person for guidance, the problem of placing nomenclature on a basis acceptable to all was acute. The early workers pointed up the great amount of redundancy in the field in their constant efforts to equate specimens with the names proposed by one or another of the early botanists who had published widely on American plants. One of Greene's problems in his relationship with Gray was the pique he felt at submitting his notes and material to Gray for comparison to avoid duplication of nomenclature (see Rodgers, 1944, page 254). A code of botanical ethics had developed which included recognition of priority, but an individual could ignore this if he so chose. Effectively, each man settled his problems according to the dictates of his own working method and the criticisms of his contemporaries. It was to be many years before the better features of both the European and American rules would be combined and taxonomists throughout the world would agree on a single set of working principles. Benjamin Lincoln Robinson (1864–1935), succeeding Watson at the Gray Herbarium, was to follow the tradition of cooperation with the European botanists which had characterized the early phases of American botany. Followers of Britton, Per Axel Rydberg (1860–1931) in western, John Kunkel Small (1869–1938) in southeastern, Henry Hurd Rusby (1855–1940) in South American botany and many other associates and contemporaries followed the American code. With time, even this dichotomy in American taxonomy has disappeared.

By the end of the 19th century, American botanical science had begun to graduate from the primary phase of pigeon-holing new taxa to the more precise work of consolidating the many entities into recognizable, workable groupings. Monography had begun in the days of Schweinitz on a limited scale. The vast accumulations of collections illustrating variation and distribution were now available so that this work could be presented in a more finished form. The synopses of Gray and Engelmann paved the way to fuller consideration of the genera found in North America. Monographic work and synopses presented before the impact of Darwin's "Origin" were limited by the concept of Divine creation. Yet, 1859 cannot be taken as the starting date for a new concept of speciation, for much pioneer work had to be done to elucidate the processes and mechanisms by which evolution functioned. While a new idea had been presented, it was to be many years after the turn of the century before it could be practically applied as a measure of the taxa.

The earliest American botanical center had long been quiescent when Gray became the acknowledged leader in American botany. While specimens were added, and some identification was carried on by Elias Durand, it wasn't until John Howard Redfield (1815–1895) became curator that the collections of the Academy of Natural Sciences of Philadelphia were mounted and the herbarium once more put on an active basis. Many of the western collections would not have been deposited in Philadelphia had it not been for another group of American botanists. These men are largely unknown to the botanists of today except as occasional collectors or donors of material. During the 1800's many persons who could not indulge in the active naming of specimens spent their funds and time accumulating large collections of specimens. Subsidizing the work of collectors by subscribing for sets of plant collections became a hobby which was particularly pronounced around the Philadelphia area. One by one, as the assemblers passed away, the collections came into a permanent repository at the Academy herbarium. One of the better known collections was that of C. W. Short of Kentucky which came to Philadelphia because the first recipient was unable to care for it. Short had published and corresponded regularly with Torrey, Gray and others so that he is well known to present-day systematists. But the collections of Gross, Williamson, Jackson, Rau, Garber, C. E. Smith, Ruth and others now nearly forgotten provided the venerable Philadelphia herbarium with the vouchers it would otherwise have missed during the western exploratory period in American botany.

Summary

The history of American botany from 1800 to 1900 is a story of radical changes in philosophy. From the concept of primary creation of rigid, invariable species to the plasticity of species within an evolutionary concept, from lack of integrated nomenclature and individual foibles in description to widely accepted codes, from scanty data and loosely handled specimens to permanently secured vouchers with accurate information; this is all part of the American botanical heritage. The early search for the useful and the ornamental with supplementary dried material for identification, was succeeded by the quest for *new species*, and, finally, by the effort to more fully understand the complexities of the American flora. By the end of the 19th century, American botany had grown so large that it had split its breeches in two directions. Taxonomists worked primarily on collections from the wild, divorcing themselves as completely as possible from horticulture where the discipline had had its beginnings, horticulture becoming, as it were, the stepchild. Furthermore, the working botanists separated into two factions over nomenclature; the one group remained conservative, and followed the lead of the Europeans and their codes, the other group sponsored radical innovations. American botany had expanded considerably from bare identification to monography, from primary taxonomy to morphology, physiology, ecology and still other fields.

Though herbarium specimens had at times been mishandled, according to our present standards, enough were preserved for our use. We have only to make allowances for the occasional mistakes to realize that we owe our present stability in botanical taxonomy to the pioneers who had to grow into the ideas which we now acknowledge as mandates. The old collections, however, still provide the nomenclatural information basic to all of the new developments in botanical science.

REFERENCES

Following the general references used in the preparation of this paper, works concerning individuals are listed in alphabetical order under the name of the principal subject.

General References

Barnhart, J. H. Some American botanists of former days. Journ. N. Y. Bot. Gard. 10: 177–190. 1909.

Beringer, G. M. The Martindale herbarium. Amer. Journ. Pharm. 66, no. 5. 1894.

Blankinship, J. W. A century of botanical exploration in Montana, 1805–1905. Collectors, herbaria and bibliography. Mont. Agric. Coll. Sci. Stud. Bot. 1: 1–31. 1905.

Britten, J. and G. S. Boulger. A biographical index of deceased British and Irish botanists. ed. 2. London. 1931.

Chardon, C. E. Los naturalistas en la America latina. I. Ciudad Trujillo. 1949.

De Candolle, A. P. Prodromus systematis naturalis regni vegetabilis, etc. vol. 4. 1830.

Eastwood, A. Early botanical explorers on the Pacific coast and the trees they found there. Quart. Calif. Hist. Soc. 18: 1–12. 1939.

Elliott, S. A sketch of the botany of South Carolina and Georgia. Charleston. 1821.

Ewan, J. Rocky Mountain naturalists. Denver. 1950.

Fernald, M. L. Some early botanists of the American Philosophical Society. Proc. Amer. Phil. Soc. 86: 63–71. 1942.

————. Some historical aspects of plant taxonomy. Rhod. 44: 21–43. 1942.

Gager, C. S. Botanic gardens of the world. Materials for a history. ed. 2. Brookl. Bot. Gard. Rec. 27: 151–406. 1938.

Gee, W. South Carolina botanists: biography and bibliography. Bull. Univ. So. Car. no. 72. 1918. (Typed copy in library, Acad. Nat. Sci. Phila.)

Geiser, S. W. Naturalists of the frontier. So. Meth. Univ. 1937.

Gray, A. Plantae Wrightianae Texano-Mexicanae, etc. Part I. Smithson. Contrib. Knowl. no. 3. 1852. Part II. Smithson. Contrib. Knowl. no. 5. 1853.

————. First lessons in botany and vegetable physiology. New York. 1857.

Haskell, D. C. The United States Exploring Expedition, 1838–1842, and its publications, 1844–1874. New York. 1942.

Harshberger, J. W. The botanists of Philadelphia and their work. Philadelphia. 1899.

Jones, M. E. Contrib. West. Bot. no. 18. 1933–1935.

Lindley, J. Introduction to the natural system of botany, etc. First American edition by J. Torrey. New York. 1831. (Presentation copy to L. D. von Schweinitz.)

Macowan, P. and H. Bolus. Catalogue of printed books and papers relating to South Africa. Part 1, botany. Trans. So. Afr. Phil. Soc. 2: 111–187. 1882.

Meehan, T. The plants of Lewis and Clark's expedition across the continent, 1804–1806. Proc. Acad. Nat. Sci. Phila. 50: 12–49. 1898.

Merrill, E. D. The botany of Cook's voyages. Chron. Bot. 14: i–iv, 161–384. 1954.

Nolan, E. J. A short history of the Academy of Natural Sciences of Philadelphia. Philadelphia. 1909.

Pennell, F. W. Botanical collectors of the Philadelphia local area. Bart. 21: 38–57. 1941; 22: 10–31. 1943.

————. Historic botanical collections of the American Philosophical Society and the Academy of Natural Sciences of Philadelphia. Proc. Amer. Phil. Soc. 94: 137–151. 1950.

Phillips, M. E. The Academy of Natural Sciences of Philadelphia. Trans. Amer. Phil. Soc. 43: 266–274. 1953.

Porter, T. C. The Pennsylvania-German in the field of the natural sciences. Proc. Pa.-Germ. Soc. 6: 1–15. 1896.

Rathbun, R. The Columbian Institute for the Promotion of Arts and Sciences. Bull. U. S. Nat. Mus. no. 101. 1917.

Rodgers, A. D., III. American botany, 1873–1892. Decades of transition. Princeton. 1944.

Ruschenberger, W. S. W. A notice of the origin, progress, and present condition of the Academy of Natural Sciences of Philadelphia. Philadelphia. 1860.

Rydberg, P. A. Scandinavians who have contributed to the knowledge of the flora of North America. Augustana Libr. Publ. no. 6. 1907.

Standley, P. C. Trees and shrubs of Mexico. Contrib. U. S. Nat. Herb. 23: 9–19. 1920.

Urban, I. Notae biographicae peregrinatorum Indiae occidentalis botanicorum. Symb. Ant. 3: 14–146. 1902.

Washington Academy of Sciences, Journal. Vol. 44, no. 11. 1954. Dedicated to Lewis and Clark, with a number of articles evaluating the expedition of 1804–1806.

Biographical References

William Baldwin.
- Darlington, W. Reliquiae Baldwinianae, etc. Philadelphia. 1843.

Joseph Barratt.
- Weatherby, C. A. Old-time Connecticut botanists and their herbaria. Rhod. 23: 121–125. 1921.

Benjamin Smith Barton.
- Barnhart, J. H. Brief sketches of some collectors of specimens in the Barton herbarium. Bart. 9: 35–42. 1926.
- Pennell, F. W. The elder Barton—his plant collection and the mystery of his floras. Bart. 9: 17–34. 1926.
- Smith, E. F. Benjamin Smith Barton, an American naturalist. Univ. of Pa. 1916.

John Bartram.
- Barnhart, J. H. Significance of John Bartram's work to botanical and horticultural knowledge. Bart. Spec. issue: 24–34. 1931.
- ————. Bartram bibliography. Bart. Spec. issue: 51–67. 1931.
- Darlington, W. Memorials of John Bartram and Humphry Marshall, etc. Philadelphia. 1849.

William Bartram.
- Harper, F. The *Vultur sacra* of William Bartram. The Auk 53: 381–392. 1936.
- Merrill, E. D. In defense of the validity of William Bartram's binomials. Bart. 23: 10–35. 1944.
- Stone, W. The work of William, son of John Bartram. Bart. Spec. issue: 1–4. 1931.

George Bentham.
- Jackson, B. D. George Bentham. London and New York. 1906.

John Bradbury.
- Stansfield, H. Plant collecting in Missouri. Liverpool Bull. 1: 17–31. 1951.
- True, R. H. A sketch of the life of John Bradbury including his unpublished correspondence with Thomas Jefferson. Proc. Amer. Phil. Soc. 68: 133–150. 1929.

Nathaniel Lord Britton.
- Howe, M. A. Nathaniel Lord Britton. Journ. N. Y. Bot. Gard. 35: 169–180. 1934.

Alvan Wentworth Chapman.
- Kimball, W. Reminiscences of Alvan Wentworth Chapman. Journ. N. Y. Bot. Gard. 22: 1–11. 1921.

Moses Ashley Curtis.
- Diehl, W. W. The fungi of the Wilkes Expedition. Mycol. 13: 38–41. 1921.
- Shear, C. L. and N. E. Stevens. The mycological work of Moses Ashley Curtis. Mycol. 11: 181–201. 1919.
- See also, Henry W. Ravenel.

Thomas Coulter.
- McVaugh, R. The travels of Thomas Coulter, 1824–1827. Journ. Wash. Acad. Sci. 33: 65–70. 1943.

William Darlington.
- Sharpless, W. T. Dr. William Darlington, physician and botanist. Bart. 14: 1–13. 1932.

Charles Robert Darwin.
- Harshberger, J. W. Charles Darwin as a botanist. Amer. Journ. Pharm. 1909: 342–351. 1909.
- MacFarlane, J. M. Charles Darwin. Three appreciations. Philadelphia. 1909.
- Weismann, A. Charles Darwin. Smithson. Report 1909: 431–452. 1910.

David Bates Douglass.
- Torrey, J. Notice of the plants collected by Douglass, etc. Amer. Journ. Sci. (1818) 4: 56–69. 1821.

- Elias Durand.
  - Chase, A. The Durand herbarium. Bart. 17: 40–45. 1935.
  - Durand, E. Plantae Prattenianae Californicae. Etc. Journ. Acad. Nat. Sci. Phila. 3: 79–104. 1855.
  - ————. Plantae Kaneanae Groenlandicae. Etc. Journ. Acad. Nat. Sci. Phila. 3: 179–204. 1855.
  - ————. A sketch of the botany of the basin of the Great Salt Lake of Utah. Trans. Amer. Phil. Soc. 11: 155–180. 1860.
  - Pennell, F. W. Elias Durand and his association with the Academy of Natural Sciences of Philadelphia. Bart. 17: 33–39. 1935.
  - See also, Constantine Samuel Rafinesque.
- George Engelmann.
  - Trelease, W. and A. Gray, ed. Botanical works of the late George Engelmann. Cambridge. 1887.
- William Gilson Farlow.
  - Clinton, G. P. William Gilson Farlow. Phytopath. 10: 1–8. 1920.
  - Jackson, C. L. William Gilson Farlow. Proc. Amer. Acad. Arts & Sci. 57: 484–491. 1922.
  - Taylor, W. R. William Gilson Farlow, promoter of phycological research in America, 1844–1919. Farlowia 2: 53–70. 1945.
- John Charles Fremont.
  - Ewan, J. Botanical explorers of Colorado—III. John Charles Fremont. Trail & Timberline. 1943.
- Asa Gray.
  - Anonymous. List of the writings of Asa Gray. Amer. Journ. Sci. 36: append. 1888.
  - Gray, J. L., ed. Letters of Asa Gray. Boston. 1894.
- Joseph Dalton Hooker.
  - MacFarlane, J. M. The late Sir Joseph Hooker. Old Penn Rev. 10. 1912.
  - Robinson, B. L. Sir Joseph Dalton Hooker (1817–1911). Proc. Amer. Acad. Arts & Sci. 62: 257–266. 1928.
- Edwin James.
  - Ewan, J. Botanical explorers of Colorado—II. Edwin James. Trail & Timberline no. 267. 1942.
- Marcus Eugene Jones.
  - Ewan, J. Botanical explorers of Colorado—VI. Marcus Eugene Jones. Trail & Timberline no. 321: 107–113. 1945.
- Humphry Marshall.
  - See, John Bartram.
- André Michaux.
  - Brunet, O. Notice sur les plantes de Michaux et sur son voyage au Canada, etc. Quebec. 1863.
  - Michaux, A. Flora boreali-americana, etc. Paris. 1803. (Copy belonging to L. D. von Schweinitz.)
- Francois André Michaux.
  - Durand, E. Biographical memoir of the late Francois André Michaux. Trans. Amer. Phil. Soc. 11: xvii–xxviii. 1860.
  - Michaux, F. A. Histoire des arbres forestiers de l'Amérique septentrionale, etc. Paris. 1810.
- Ezra Michener.
  - Shear, C. L. and N. E. Stevens. The botanical work of Ezra Michener. Bull. Torr. Bot. Club 44: 547–558. 1917.
- Gotthilf Henry Ernest Muhlenberg.
  - Hitchcock, A. S. The grasses of the Muhlenberg herbarium. Bart. 14: 27–52. 1932.
  - Maisch, J. M. Gothilf Heinrich Ernst Mühlenberg als botaniker. Pharm. Rundschau. June, 1886.
  - Merrill, E. D. and S. Y. Hu. Work and publications of Henry Muhlenberg with special attention to unrecorded or incorrectly recorded binomials. Bart. 25: 1–66. 1949.
  - Muhlenberg, G. H. E. A catalogue of the hitherto known native and naturalized plants of North America. Lancaster. 1813.
- Thomas Nuttall.
  - Beidlemann, R. G. The 1818–1820 Arkansas journey of Thomas Nuttall. Ark. Hist. Quart. Autumn, 1956.
  - Durand, E. Biographical notice of the late Thomas Nuttall. Proc. Amer. Phil. Soc. 7: 297–315. 1860.

  - Graustein, J. E. Nuttall's travels into the old northwest. Chron. Bot. 14: 1–88. 1951.
  - Pennell, F. W. An English obituary account of Thomas Nuttall. Bart. 19: 51–54. 1938.
  - ————. Travels and scientific collections of Thomas Nuttall. Bart. 18: 1–51. 1936.
  - Powers, W. H. Some facts in the life of Thomas Nuttall. Sci. 62: 389–391. 1925.
  - Tatnall, R. R. Nuttall's plant collections in southern Delaware. Bart. 20: 1–6. 1939.
- Samuel Bonsall Parish.
  - Jepson, W. L. Samuel Bonsall Parish. Univ. Calif. Publ. Bot. 16: 427–444. 1932.
- Charles Christopher Parry.
  - Ewan, J. Botanical explorers of Colorado—I. Charles Christopher Parry. Trail & Timberline no. 268. 1941.
- Charles Pickering.
  - Ruschenberger, W. S. W. Notice of the late Dr. Pickering. Proc. Acad. Nat. Sci. Phila. 30: 166–170. 1878.
- Thomas Conrad Porter.
  - Britton, N. L. Thomas Conrad Porter. Bull. Torr. Bot. Club 28: 369–373. 1901.
  - Ewan, J. Botanical explorers of Colorado—V. Thomas Conrad Porter. Trail & Timberline no. 305: 55–57. 1944.
  - Porter, T. C. and J. M. Coulter. Synopsis of the flora of Colorado. U. S. Dept. Int. Misc. Publ. no. 4. 1874.
- Cyrus Gurnsey Pringle.
  - Davis, H. B. Life and works of Cyrus Gurnsey Pringle. Burlington. 1936.
- Frederick Traugott Pursh.
  - McVaugh, R. A study of the plant collections made by Frederick Pursh during a trip to New York and Vermont in the year 1807. Bart. 17: 24–32. 1935.
  - Pursh, F. T. Flora Americae septentrionalis, etc ed. 2. London. 1816.
- Constantine Samuel Rafinesque.
  - Merrill, E. D. A generally overlooked Rafinesque paper. Proc. Amer. Phil. Soc. 86: 72–90. 1942.
  - ————. Rafinesque's publications from the standpoint of world botany. Proc. Amer. Phil. Soc. 87: 110–119. 1943.
  - ————. C. S. Rafinesque, with notes on his publications in the Harvard libraries. Harv. Libr. Bull. 2: 5–21. 1948.
  - Pennell, F. W. The life and work of Rafinesque. Transylv. Coll. Bull. 15: 10–70. 1942.
  - ————. How Durand acquired Rafinesque's herbarium. Bart. 23: 43–46. 1944.
  - ————. The last sickness of Rafinesque. Bart. 25: 67–68. 1949.
  - Quatre, H. Rafinesque: a concrete case. Arch. Bot. 24: 3–18. 1948. (H. Quatre is the nom de plume of Leon Croizat).
- Henry W. Ravenel.
  - Stevens, N. E. Two southern botanists and the Civil War. Sci. Month. 1919: 157–166. 1919.
  - ————. The mycological work of Henry W. Ravenel. Isis 18: 133–149. 1932.
- John Howard Redfield.
  - Meehan, T. John Howard Redfield. Proc. Acad. Nat. Sci. Phila. 47: 292–301. 1895.
- Benjamin Lincoln Robinson.
  - Fernald, M. L. Biographical memoir of Benjamin Lincoln Robinson, 1864–1935. Nat. Acad. Sci. Biog. Mem. 17: 305–330. 1937.
  - ————. Benjamin Lincoln Robinson (1864–1935). Proc. Amer. Acad. Arts & Sci. 71: 539–542. 1937.
- Henry Hurd Rusby.
  - Moldenke, H. N. Henry Hurd Rusby. Chron. Bot. 7: 230–231. 1942.
- Charles Sprague Sargent.
  - Rehder, A. Charles Sprague Sargent. Journ. Arn. Arb. 8: 69–86. 1927.
- Lewis David von Schweinitz.
  - Arthur, J. C. The interpretation of Schweinitzian and other early descriptions. Amer. Nat. 1883; 77–78. 1883.
  - ———— and G. R. Bisby. An annotated translation of the part of Schweinitz's two papers giving the rusts of North America. Proc. Amer. Phil. Soc. 57: 173–292. 1918.
  - Barnhart, J. H. The botanical correspondents of Schweinitz. Bart. 16: 19–36. 1934.
  - Benedict, D. M. Lewis David von Schweinitz, the mycologist. Bart. 16: 12–14. 1934.
  - ———— Schweinitz' botanical library. Bart. 16: 14–19. 1934.
  - Johnson, W. R. A memoir of the late Lewis David von Schweinitz, P. D. Philadelphia. 1835.

Keating, W. H. Narrative of an expedition to the source of St. Peter's River, etc. Philadelphia. 1824. With an appendix by Schweinitz on the Say plant collections.
Pennell, F. W. The botanist Schweinitz and his herbarium. Bart. 16: 1–8. 1934.
Rogers, D. P. On the dates of publication of Schweinitz's synopses. Mycol. 36: 526–531. 1944.
Schallert, P. O. Schweinitz' collecting ground in North Carolina. Bart. 16: 8–12. 1934.
Schweinitz, L. D. von. Flora Salemitana sistens plantas et vegetabilia, etc. 1821. Manuscript in the library, Academy of Natural Sciences of Philadelphia.
————. Catalogue (of the Schweinitz herbarium), with a list of contributors. Manuscript, library of the Academy of Natural Sciences of Philadelphia.
Shear, C. L. and N. E. Stevens. Studies of the Schweinitz collections of fungi. I. Mycol. 9: 191–204. 1917. II. Mycol. 9: 333–344. 1917.
———— ed. The correspondence of Schweinitz and Torrey. Mem. Torr. Bot. Club. 16: 119–300. 1921. Including, Barnhart, J. H. Biographical notices of persons mentioned in the Schweinitz-Torrey correspondence. pp. 290–300.

Charles Wilkins Short.
Gross, S. D. Biographical sketch of Charles Wilkins Short. Philadelphia. 1865.

Wilhelm N. Suksdorf.
Carter, E. A. Suksdorf, pioneer botanist. Amer.-Germ. Rev. 8: 11–12. 1942.
Weber, W. A. The botanical collections of Wilhelm N. Suksdorf, 1850–1932. Res. Stud. State Coll. Wash. 12: 51–121. 1944.

William Starling Sullivant.
Rodgers, A. D., III. "Noble Fellow" William Starling Sullivant. New York. 1940.

John Torrey.
Anonymous. Death of Professor Torrey. N. Y. Observer. March 13, 1873.
————. Death of Dr. Torrey. Bull. Torr. Bot. Club. 4: 9–10. 1873.
Gray, A. John Torrey: a biographical notice. Amer. Journ. Sci. & Arts 5: 1–11. 1873.
Thurber, G. Inaugural address. Bull. Torr. Bot. Club. 4: 26–39. 1873.
See also, Lewis David von Schweinitz.

William Trelease.
Buchholz, J. T. William Trelease, 1857–1945. Sci. 101: 192–193. 1945.

Thomas Walter.
Maxon, W. R. Thomas Walter, botanist. Smithson. Misc. Coll. 95: no. 8. 1936.
Walter, T. Flora Caroliniana, etc. London. 1788. Reprint. 1946.

PLATE 1.

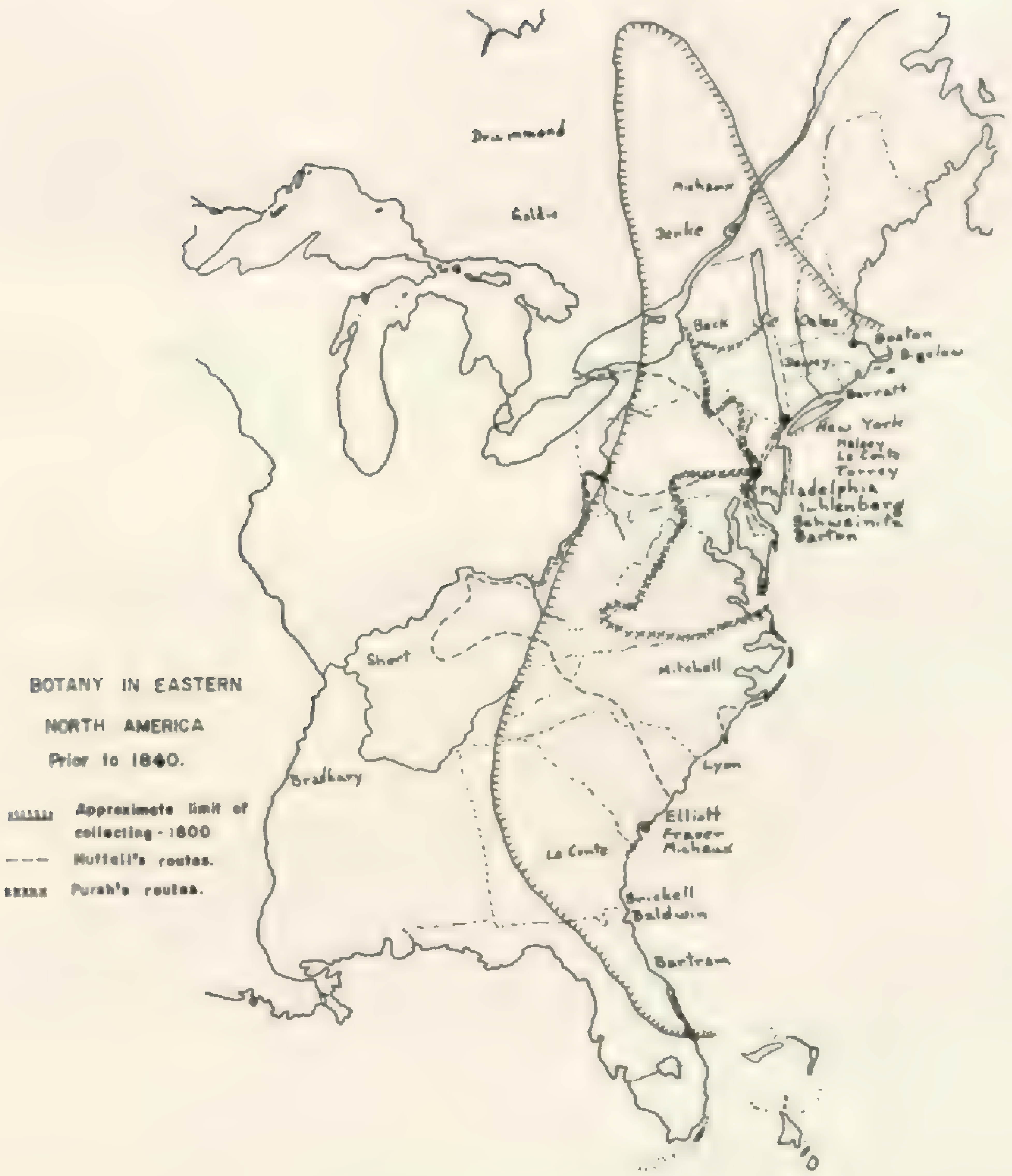
Upper Map. Late in the 18th century, as botany in North America became the province of American collectors and botanists, knowledge of the flora was restricted to the eastern edge of the continent. Both Frederick Pursh and Thomas Nuttall found profitable collecting in the wilds of the eastern mountains.

Lower Map. By the mid 19th century, when the centers of American botany had shifted to John Torrey in New York and Asa Gray in Cambridge, a flood of specimens inundated the taxonomists from the area west of the Mississippi River. The magnitude of the collections may be surmised from the cobweb of exploration routes criscrossing the western portion of the United States.

Appendix

As an aid to botanists who must struggle with the historically important 19th century American collections, a selection of samples of penmanship has been prepared. Some recent botanists whose handwriting is better known, have been included in the hope that it will assist in the identification of some of the numerous unsigned annotations found on the sheets in many herbaria. The penmanship of several European botanists has been included because of their important work on American plants, and their frequent exchanges of specimens with American botanists. These samples were compiled largely from correspondence in the library of the Academy of Natural Sciences of Philadelphia.

PLATE 1.


BOTANY IN EASTERN
NORTH AMERICA
Prior to 1840.
Approximate limit of collecting - 1800
Nuttall's routes.
Pursh's routes.
Drummond
Goldie
Michaux
Jenke
Beck
Oakes
Dewey.
Boston
Bigelow
Barratt
New York
Halsey
Le Conte
Torrey
Philadelphia
Muhlenberg
Schweinitz
Barton
Short
Mitchell
Bradbury
Lyon
Elliott
Fraser
Michaux
Le Conte
Brickell
Baldwin
Bartram

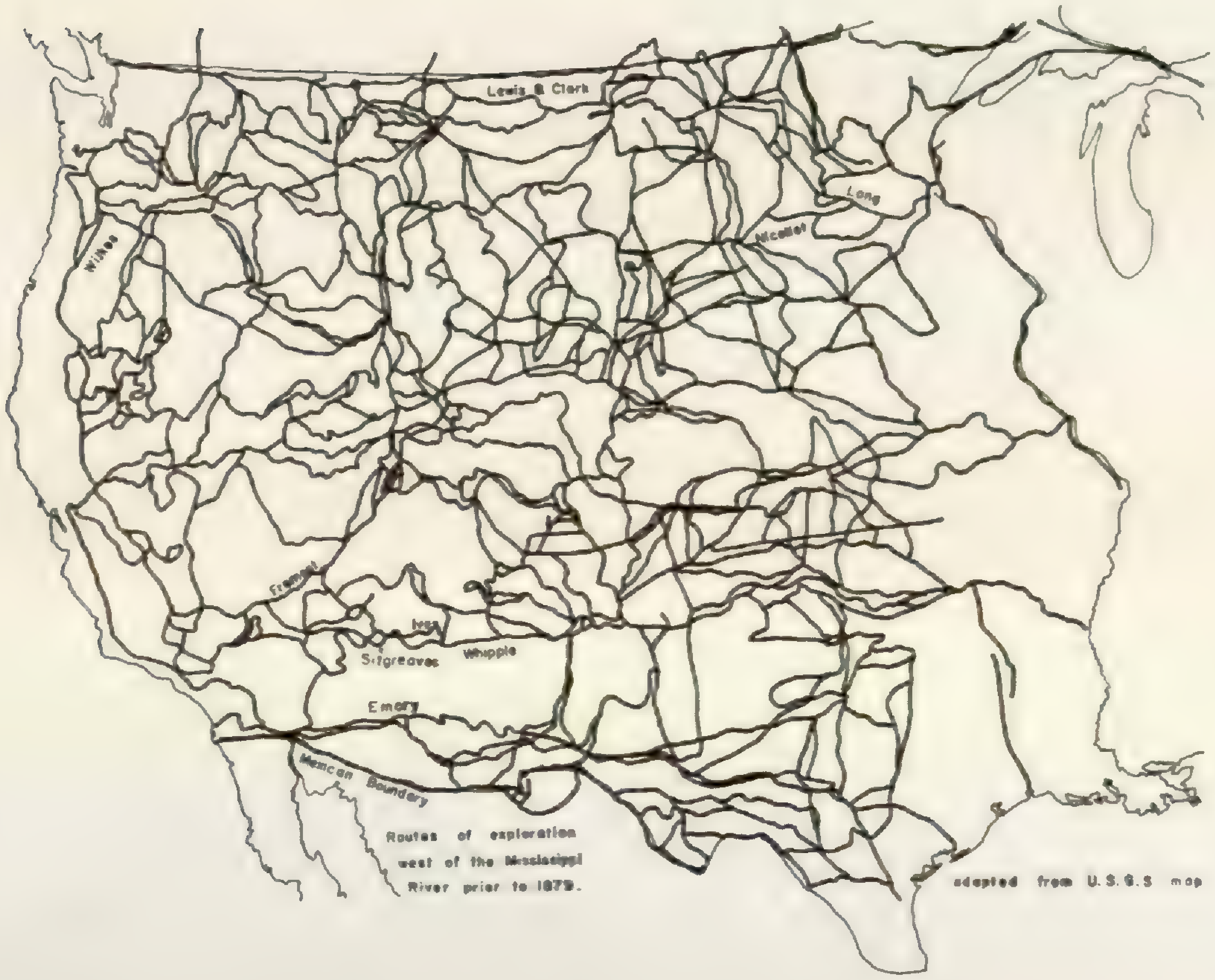

Lewis & Clark
Long
Nicollet
Wilkes
Fremont
Ives
Sitgreaves
Whipple
Emory
Mexican Boundary
Routes of exploration
west of the Mississippi
River prior to 1879.
adapted from U.S.G.S map

PLATE 2.

J. W. Bailey

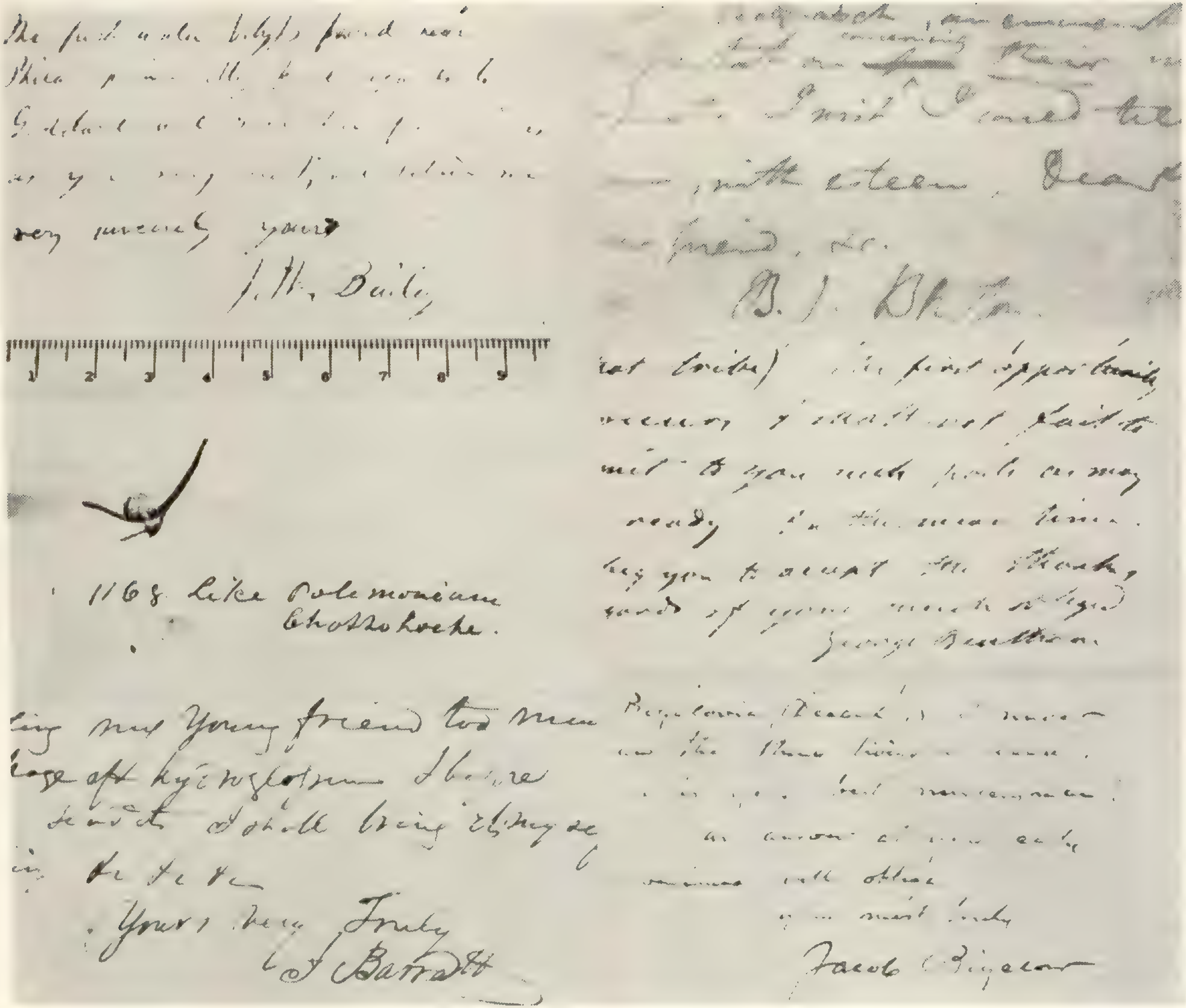
B. S. Barton

William Baldwin

George Bentham

Joseph Barratt

Jacob Bigelow



[illegible]

very sincerely yours

J. W. Bailey

[illegible] with esteem, Dear [illegible]

[illegible] friend, &c.

B. S. Barton

1168. like Polemonium
Chattahooche.

[illegible] first opportunity [illegible] I shall not fail to [illegible] to you such [illegible] as may [illegible] ready [illegible] in the mean time [illegible] beg you to accept [illegible] thanks [illegible] of your much obliged

George Bentham

[illegible] my Young friend too [illegible]

Yours very Truly

J Barratt

Bigelowia (Decand.) [illegible]

[illegible] most truly

Jacob Bigelow

PLATE 3.

T. S. Brandegee

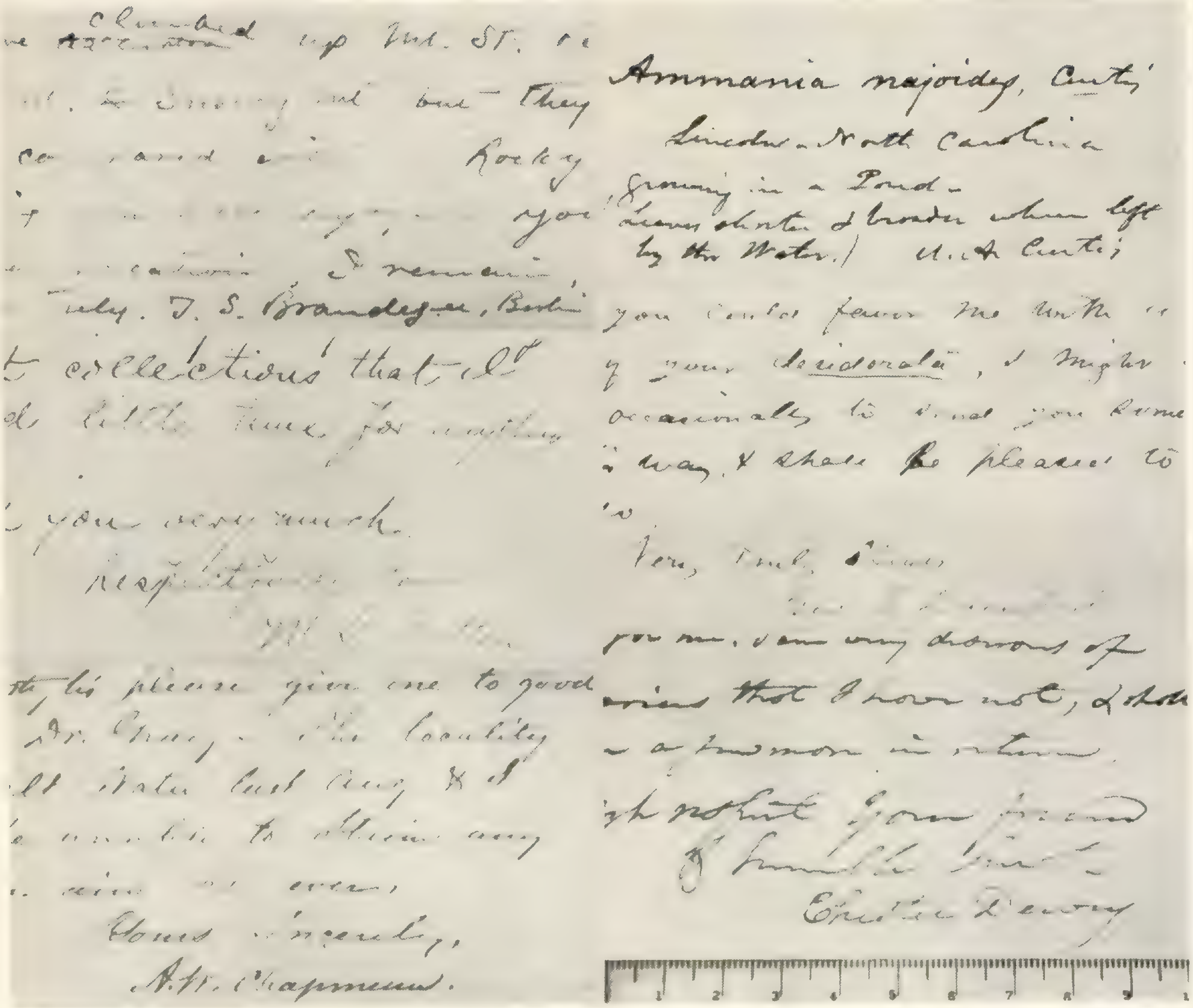
M. A. Curtis

N. L. Britton

G. E. Davenport

A. W. Chapman

Chester Dewey



[illegible] climbed up Mt. St. [illegible]
[illegible] they
[illegible] Rocky
[illegible] you
[illegible] I remain
truly. T. S. Brandegee, Berk

collections that I
little time for writing

you very much.
respectfully
[illegible]

be pleased give me to good
Dr. Gray. [illegible] locality
[illegible] data but any & I
unable to obtain any
[illegible] even.
Yours sincerely,
A. W. Chapman.

Ammannia najoides, Curtis
Lincoln. North Carolina
Growing in a Pond.
Leaves shorter & broader when left
by the Water.) M. A. Curtis

you could favor me with
of your [illegible], I might
occasionally to send you some
way, & shall be pleased to

Very truly yours
[illegible]

you me. I am very desirous of
[illegible] that I have not, & shall
[illegible] in return.
[illegible] Your friend
& humble servant
Chester Dewey

PLATE 4.

J. B. Ellis

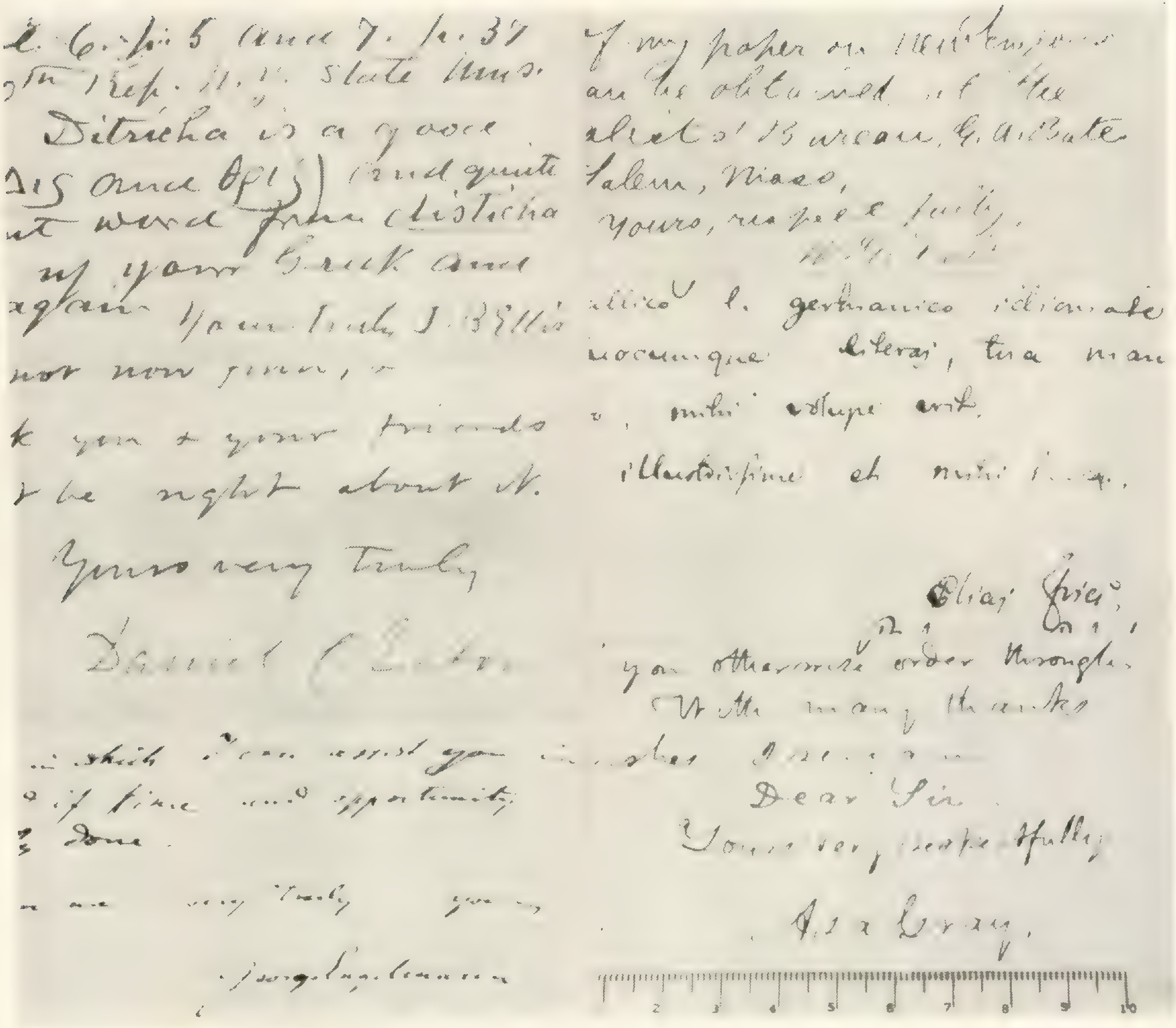
W. G. Farlow

D. C. Eaton

E. M. Fries

George Engelmann

Asa Gray (about 1830)



L. C. p. 5 and 7. p. 37
9th Rep. N. Y. State Mus.
Ditricha is a good
[illegible] (and quite
ut word from distichia
up your back and
again Yours truly J. B. Ellis

not now given, ...

k you & your friends
& be right about it.

Yours very Truly

Daniel C. Eaton

[illegible] which I can assist you [illegible]
[illegible] if time and opportunity
[illegible] done.

[illegible] very truly yours

George Engelmann

of my paper on [illegible]
can be obtained at the
[illegible] Bureau, G. A. Bates
Salem, Mass.
Yours, respectfully,
W. G. Farlow

[illegible] l. germanico idiomate
[illegible] literas, tua man
[illegible], mihi volupe erit.
illustrissime et mihi [illegible]

Elias Fries

you otherwise order through
With many thanks
[illegible]
Dear Sir.
Yours very respectfully
Asa Gray.

PLATE 5.

R. K. Greville

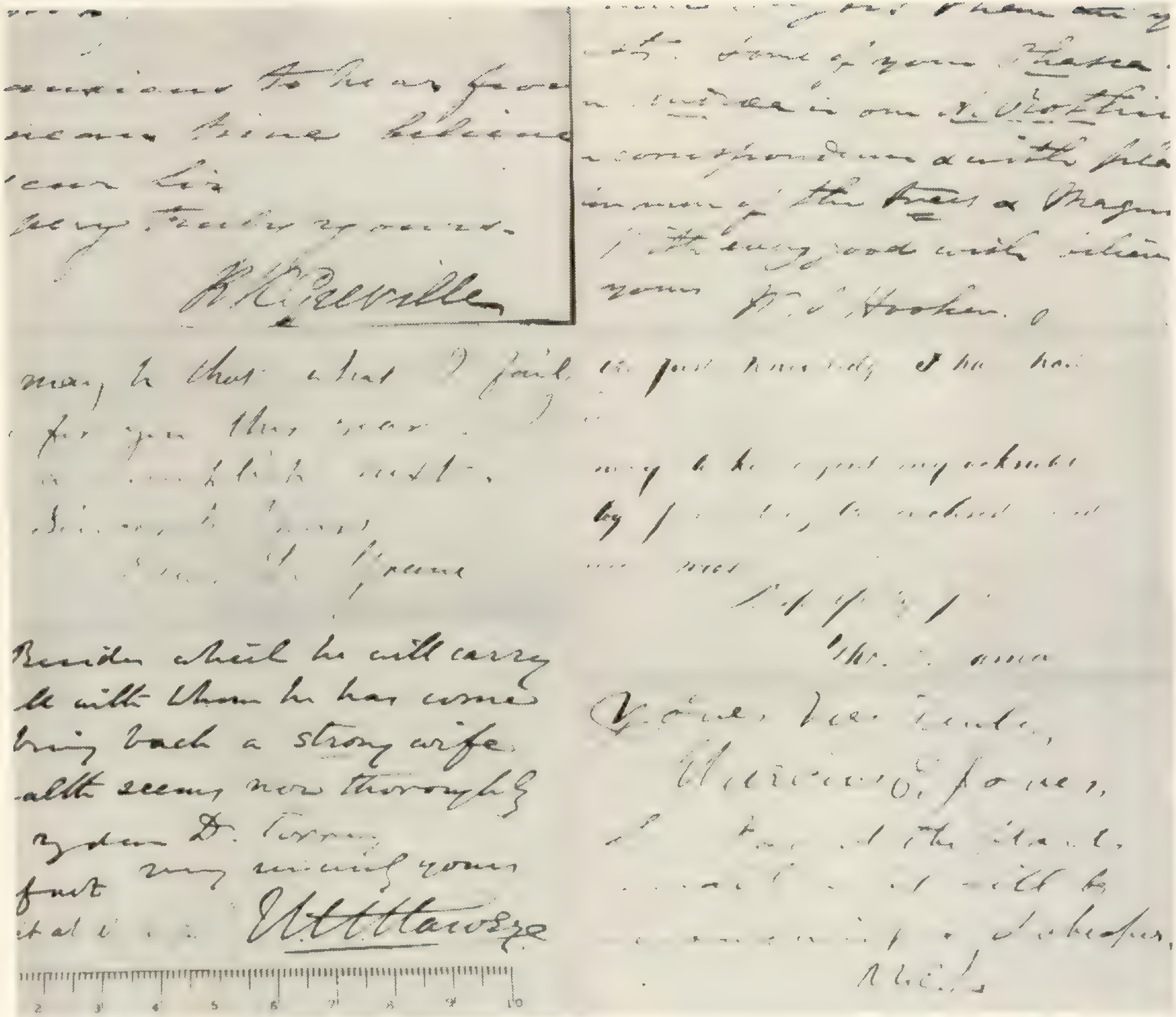
W. J. Hooker

E. L. Greene

T. P. James

W. H. Harvey

M. E. Jones



anxious to hear from

[illegible] believe

Dear Sir

[illegible] very truly yours

R. K. Greville

Some of your Plates.

correspondence & with

the [illegible] & Magaz

very good with

yours W. J. Hooker.

Besides which he will carry

with them he has come

bring back a strong wife

seems now thoroughly

Dr. Torrey

very sincerely yours

W. H. Harvey

Yours very truly,

Marcus E. Jones,

PLATE 6.

Leo Lesquereux

Thomas Nuttall

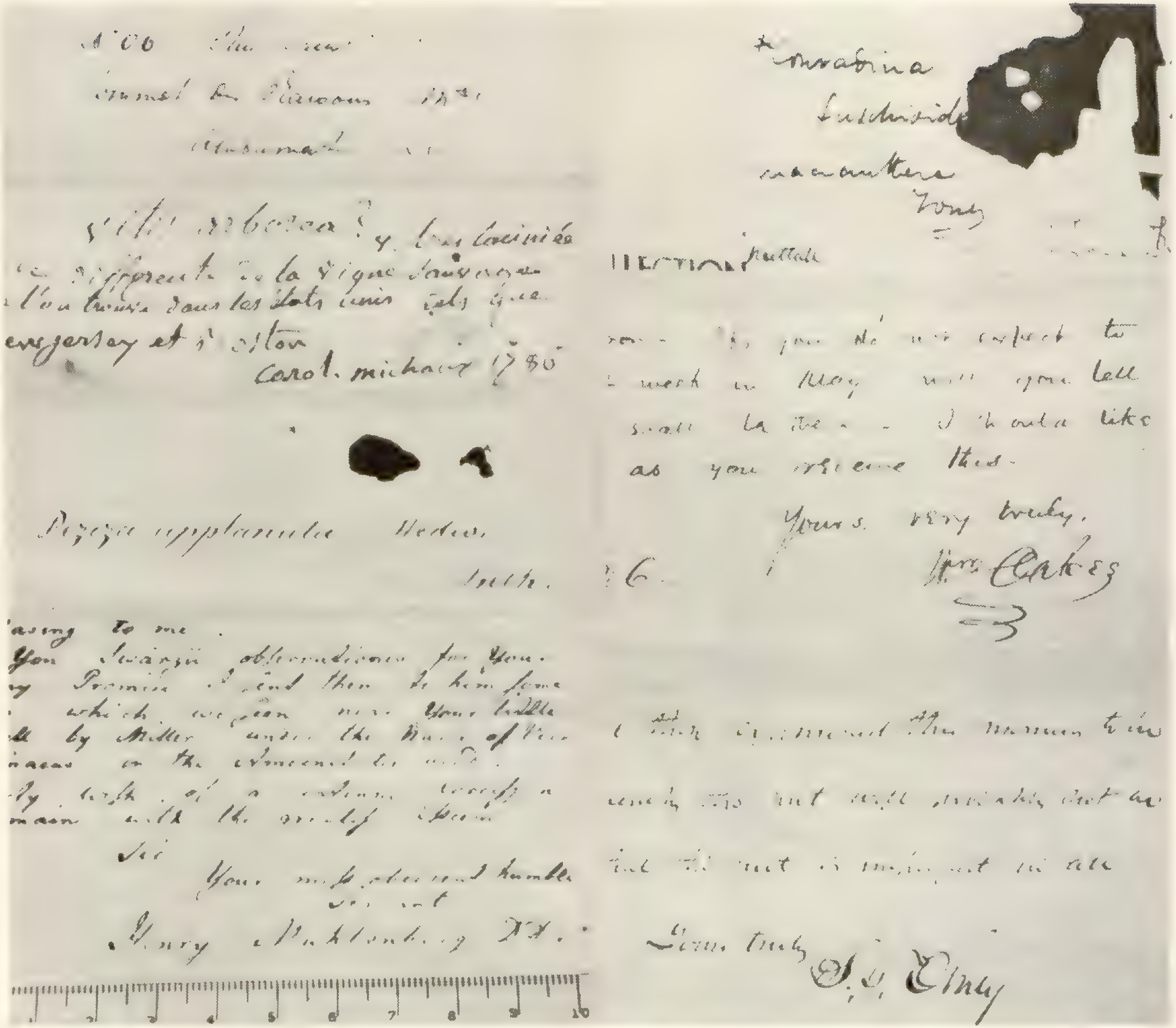
André Michaux

Elias Michener

William Oakes

H. G. Muhlenberg

S. T. Olney



N° 66 [illegible]

[illegible]

Vitis arborea? 4. tres laciniée
[illegible] differente de la Vigne sauvage
[illegible] l'on trouve dans les états unis tels que
ewjersay et [illegible]
Carol. michaux 1786

[illegible] applanata Hedw.

[illegible]

[illegible]asing to me.
You Swanzii observations for You.
[illegible] Promise I send them to him some
[illegible] which we can [illegible] Your little
[illegible] by Miller under the Name of [illegible]
[illegible] in the [illegible]
[illegible]
[illegible]main with the [illegible]
Sir
Your most obedient humble
servant
Henry Muhlenberg D.D.

*Conradina
[illegible]
[illegible]
[illegible]

Nuttall

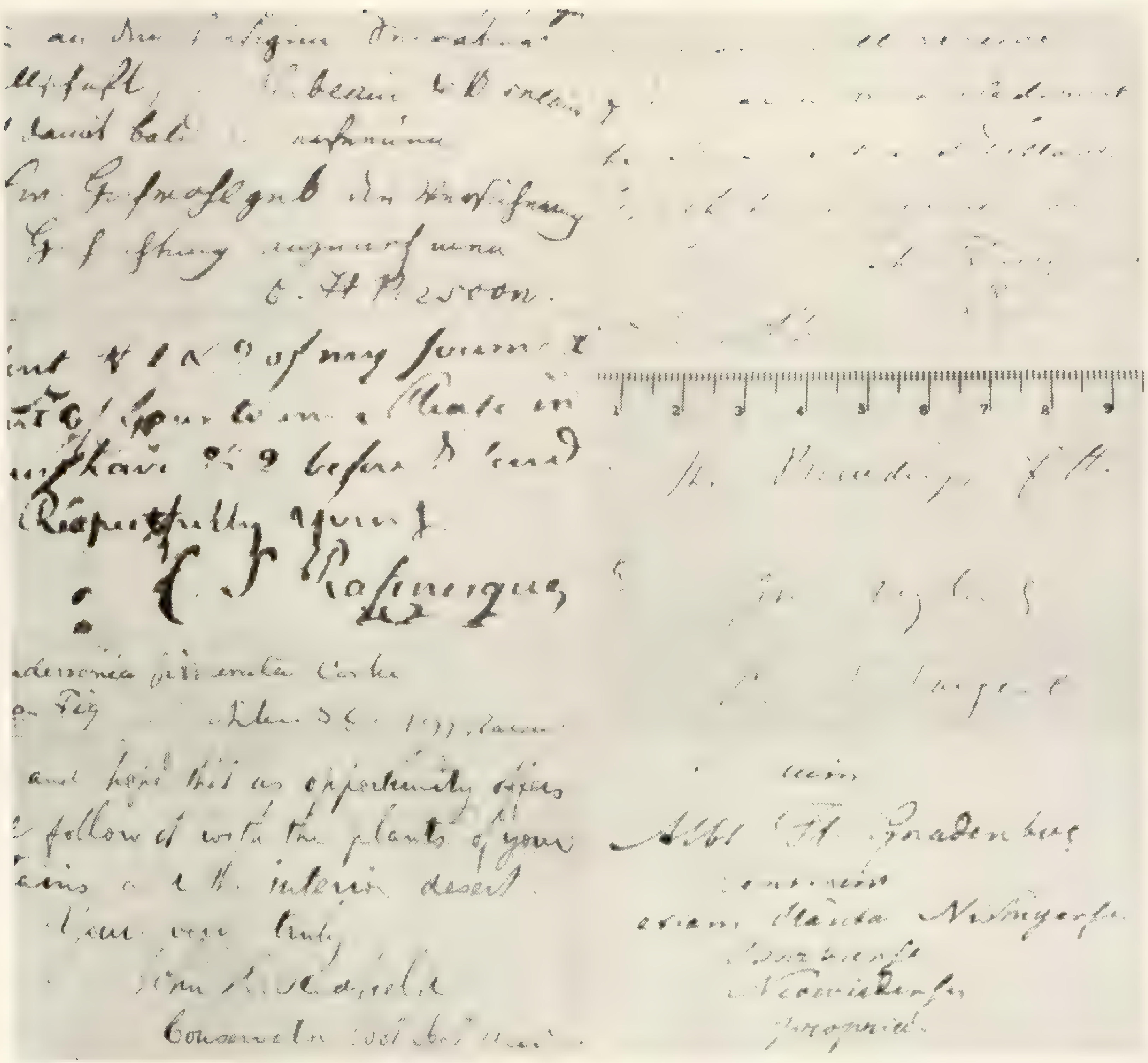
[illegible] if you do not expect to
[illegible] week in May will you tell
[illegible] I should like
as you receive this.

Yours very truly,
Wm Oakes

[illegible]

Yours truly S. T. Olney

PLATE 7.



C. H. Persoon

B. L. Robinson

C. S. Rafinesque

C. S. Sargent

H. W. Ravenal

J. H. Redfield

L. D. von Schweinitz

PLATE 8.

C. F. Schwägrichen

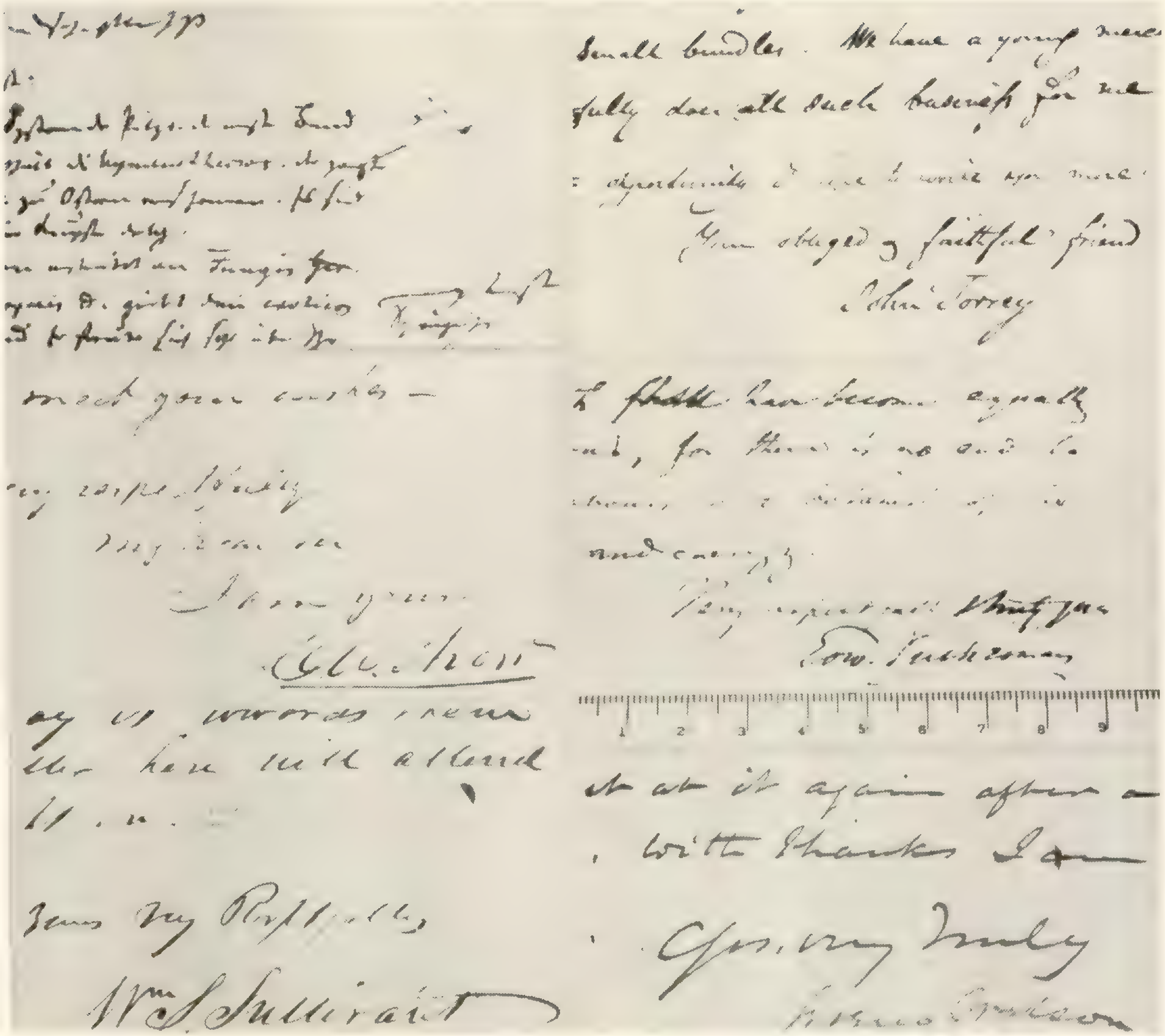
John Torrey

C. W. Short

Edward Tuckerman

W. S. Sullivant

Sereno Watson



[illegible]

small bundles. We have a young man
fully does all such business for me
opportunity [illegible] to write you more.
Your obliged & faithful friend
John Torrey

meet your wishes —
very respectfully
My dear sir
I am yours
C. W. Short

[illegible] shall have become equally
[illegible], for there is no end to
[illegible]
and energy.
Very respectfully truly yours
Edw. Tuckerman

[illegible] words from
[illegible] here will attend
[illegible]
Yours very Respectfully
Wm S. Sullivant

at it again after a
with thanks I am
Yours very truly
Sereno Watson

Our Dwarf Bindweeds

EDGAR T. WHERRY
University of Pennsylvania

The only North American dwarf bindweed which came to his attention was named by Linnaeus[1] *Convolvulus spithamaeus.* His specimen[2] shows oblong leaves with cuneate to truncate base, and although the young growth is rather pubescent, the mature leaves are but sparsely so.

In the course of his visit to Quebec, Michaux[3] collected a taxon differing in the leaves being auriculate and the pubescence more lasting, and named it *Convolvulus stans.* This was reduced to *C. spithamaeus* var. *stans* by Fogelberg.[4] A related plant from the north-central plains was named by Greene[5] *C. camporum,* but it differs so little from that of Michaux as to be deemed a variant unworthy of nomenclatorial recognition.

When Pursh[6] explored the shale barrens around Warm Springs, West Virginia, he observed another member of the group, characterized by narrowly oblong auriculate leaves retaining copious pubescence to maturity, and named it *Calystegia tomentosa.* His species epithet can not be used in *Convolvulus* because previously applied in that genus to a wholly different taxon, so the writer[7] renamed the shale-barren one *Convolvulus purshianus.* In the supplement to his Flora Pursh[8] recognized the existence further south of still another taxon, and named it *Calystegia catesbeiana.* Gray[9] considered this unworthy of species status, and since it showed a tendency to twine, classed it as *Convolvulus sepium* var. *pubescens* (although it is by no means always especially pubescent).

In a herbarium study of these plants, Tryon[10] accepted only two taxa, *Convolvulus spithamaeus,* typical [var.] and var. *catesbeianus.* The unique shale-barren endemic was classed as "an intermediate between" the two, and not awarded nomenclatorial recognition. In the 8th edition of Gray's Manual Fernald[11] agreed with this viewpoint, but, as the rules require, transferred Gray's varietal epithet to replace *catesbeianus.*

Field trips on which search for these plants was emphasized, extending from Minnesota to Quebec and to Georgia, have led the writer to favor a different interpretation. In his experience four taxa can be recognized by habit and foliage, readily while travelling on foot, and with fair certainty from a moving automobile. As their habitats and ranges, though overlapping to some extent, are on the whole dissimilar, they are now considered worthy of subspecies segregation, and the following combinations are accordingly proposed: *Convolvulus spithamaeus* L. **subspecies:**

---

[1] Species Plantarum: 158, 1753.

[2] Illustrated in Rhodora 41: facing p. 416, 1939.

[3] Flora Bor.-Amer. 1: 136, 1803.

[4] Trans Wisc. Acad. Sci. 30: 24, 1937.

[5] Pittonia 3: 328, 1898.

[6] Flora Amer. Sept. 1: 143, 1814.

[7] Proc. Pa. Acad. Sci. 7: 163, 1933.

[8] Flora Amer. Sept. 2: 729, 1814.

[9] Man. Bot., ed. 5: 376, 1867.

[10] Rhodora 41: 415, 1939.

[11] Man. Bot., ed. 8: 1181, 1950.

α-spithamaeus Wherry;[12] the original taxon.
catesbeianus (Pursh) Wherry; *Calystegia catesbeiana* Pursh, *loc. cit.*
purshianus Wherry; *Convolvulus purshianus* Wherry, *loc. cit.*
stans (Michaux) Wherry; *Convolvulus stans* Michx., *loc. cit.*

KEY TO SUBSPECIES OF CONVOLVULUS SPITHAMAEUS

A. Stem twining for more than half its length; petiole often half as long as leaf-blade, which tends to be ovate and cordate-auriculate, and varies markedly in pubescence; range, Fla. to Va. .... 1. *catesbeianus.*
A′. Stem strict or at most twining for less than half its length; petiole usually less than half as long as blade: B, B′.
B. Mature foliage sparsely to moderately pubescent; leaf-blade tending to be broadly oblong or elliptic, basally cuneate, truncate, or obscurely auriculate; range, Tenn. to s. Can. 2. *α-spithamaeus.*
B′. Mature foliage copiously pubescent; leaf-blade cordate-auriculate: C, C′.
C. Leaf-blade tending to be narrowly oblong and petiole less than 1/3 as long as blade; range, Va. to Pa. .... 3. *purshianus.*
C′. Leaf-blade tending to be broadly oblong and petiole 1/3 as long as blade; range, Iowa to N. S. .... 4. *stans.*

Subspecies *catesbeianus* is regarded as the most primitive of the group, in that it retains considerable of the tendency to twine which characterizes the presumptive ancestor, *Convolvulus sepium.* It grows on gravelly or loamy slopes over both limy and siliceous rocks from the Gulf coast to the Appalachians, Florida to Indiana and Virginia.

Its descendant subspecies *α-spithamaeus* occupies similar habitats over a somewhat more northern range, Tennessee to Wisconsin, southernmost Canada and Maine. It has an uncanny ability to appear suddenly on fresh road cuts and fills, presumably from fragments of its rhizomes brought in as " hitch-hikers " on earth-moving equipment.

The one designated subspecies *purshianus* is a striking member of the endemic flora of the Appalachian " shale-barrens," south-facing ledges of hard Devonian shale developed especially along the Virginia-West Virginia border. It is, however, not limited to these barrens, and locally spreads into areas of softer shale or clay-loam, northeast as far as central Pennsylvania.

Subspecies *stans* is the most northern of the group. It grows especially on heaps of glacial till and alluvial gravel, but also invades prairie grassland. Its range is from Iowa and Minnesota eastward to Nova Scotia, overlapping that of ssp. *purshianus* at latitude 41° in Pennsylvania.

---

[12] The writer favors designating lower categories including types of higher ones by the prefix α. Workers who prefer stricter conformity with current rules need merely delete the prefix and the author's name to obtain the desired anonymous tautonymy.

Notes on Color, Lobing and Freaks in Phlox subulata

WALTER AINSWORTH
Pontiac, Michigan

The following observations were made on *Phlox subulata* L. growing on what are known as the " Unionville Barrens ". These barrens are characterized by serpentine rock and are situated 1.6 miles northeast of Unionville in Chester Co., Pa. They center at 39° 54′ 41″ North and 75° 42′ 54.5″ West. The barrens were visited on May 21 and 22, 1950, a year in which spring was late. The frequency as well as the intervening threat of rain greatly restricted the possible number of observation dates.

At first sight the flowers on the barrens seem to have corolla lobes of almost infinite variety, but actual measurement shows them to stay between a " rounded " extreme which is 5½ mm. long by 7 mm. wide and a " narrow " one 10 mm. long by 6 mm. wide. In no case was one found less than 5 mm. long or 5 mm. wide. Measurements of length were made from the edge of the throat of the tube to the base of the notch at the center of the outside edge of the lobe. This notch ranges in depth from 0.5 mm. to 2.0 mm., varying somewhat even on the same plant.

As is well known, this phlox presents great variation in the color and pattern of the markings on the corolla lobes. By far the most common color, a bluish pink, was well represented by J6 on plate 43 of the Maerz and Paul Dictionary of Color. A less common color type, of the distinctly red hue, was matched by K6 on plate 43.

In any exact studies of the color of the lobes, the element of fading will have to be given special attention. This point forces itself upon the observer as he notices plants on which several of the flowers are white, while the rest are a pale pink; or other cases in which the pink area of the lobe is completely bordered by white around its edge. The question then arises, how much of a factor is fading and does it have a pattern?

Another notable feature is the great variation in " eye-spotting " at the base of the corolla lobe. In the usual case, there is a small white area a few millimeters wide at the base of the lobe, of which there is a " V " shaped mark of a dark cherry color. (Matching this with the color guide is difficult due to its small size.). Variations in this usual type of spotting noted were: entire lobe pink, with no white at base; entire lobe pink with a small much redder diffuse patch at its base; and lobe pink, the white " eye " at base bearing two small delicately violet spots. Of particular interest was the occurrence of pairs of flowers, one of whose lobes has the white " eye " while the other flower's lobes haven't a trace of white at the base. Among such pairs, those lobes having the " eye " spot also bore the dark cherry " V ", while those lobes not having any white had the redder diffuse area at the base. The presence of these " white vs. non-white " pairs of flowers on the same plant is very striking.

One possible explanation of this is that the dark cherry " V " pigment gradually spreads through the immediately surrounding white tissue. The occurrence of the dissimilar pairs would lend some support to this idea, but, on the other hand, their relative infrequency—about 1 pair per hundred flowers—would indicate that the matter needs further investigation.

In the course of the present observations, in which about 2,000 flowers were examined, there appeared quite a few flowers whose corollas had less or more than 5 lobes of the usual type. By actual count, 24 flowers were 4-lobed; 36 were 6-lobed; 6 were 7-lobed and 1 was 8-lobed. The fact that each of these supernumerary lobes had distinctive markings at its base established them as real lobes and not erratic fragments of normal lobes. Flowers containing more than 6 lobes were not radially symmetrical, the supernumerary lobes being set at an angle and crowded. Usually there are about three flowers per shoot in bloom simultaneously and where other than 5-lobing was involved, at least one of the flowers had the normal 5-lobing. One remarkable plant had flowers with respectively 5, 6 and 7 lobes!

Especially interesting were some " freaks ", the so-called hose-in-hose type of flower, in which one corolla projects out of another. Three plants bearing such freaks were noted. On the first of these, a corolla having only 3 lobes was inserted in a normal 5-lobed one. On the second plant were two freaks: one with a 4-lobed corolla projecting from a 5-lobed; a second having a 4-lobed corolla inserted in another of 4 lobes. The third plant was remarkable in having 3 freaks: two of them showed a 5-lobed corolla stuck in another of 5 lobes, while the third had a 3-lobed corolla inserted in a 5-lobed one. These freaks were left undisturbed, with the thought that anatomical investigation of the same individuals might be undertaken at a later date.

As possible pollinating agents, three different types of insect visitors were seen: a large, black butterfly of the swallow-tail group; a small, black flying beetle; and a large, black ant together with a much smaller brown one.

Bennett Bog Now a Nature Sanctuary

About 3 miles north of Cape May City—the southern tip of New Jersey—there is a small community known for many years as Bennett, although recently named Erma. Toward the west side of this settlement there are several depressions, a few acres in extent, in which th plant life is markedly different from that in the surrounding country; these have come to be termed in botanical literature the Bennett Bogs.

That rare native plants occur in these areas was first noted on July 24, 1907, by Bayard Long and the late S. S. Van Pelt, Philadelphia botanists. On this occasion the two species discovered were the Snowy Orchid, *Habenaria nivea,* and the Narrow-leaved Boltonia, *Boltonia asteroides* variety *glastifolia.* Subsequent visits by these and other botanists, both amateur and professional, disclosed the presence of a dozen or more additional species which seemingly reach the northern limit of their range at this point. The interest of these occurrences was pointed out by Witmer Stone in his famous volume, the Plants of Southern New Jersey, and numerous botanists, reading his account, have been led to visit " Bennett Bogs " to see for themselves the remarkable assemblage of plants growing there.

In a strict sense, these plant communities are not really bogs, but meadows occupying slight depressions in a clayey substratum, which in seasons of considerable rainfall accumulate water enough to become shallow ponds. Sphagnum and other bog mosses are only sparsely developed, in a few marginal spots. Most of the vegetation is composed of grasses and sedges, with forbs scattered among them.

The two meadow-depressions where most of the notable plants grow seem not to have been seriously affected by man's activities. A hundred years ago, when the records indicate that the water level was relatively high, the larger of the two was known (after an owner for a time) as Teal Pond, and was a favorite site for duck shooting, ice skating, and cutting ice for storage on local farms. When in the course of time the sites became drier, the vegetation was annually cut for hay. Stone remarked that this, unexpectedly, seemed not to injure the rare plants.

Man can, however, think up ways to damage or destroy spots of scientific interest. Local mosquito-control commissions, visiting the place during periods of abundant rainfall, got the mistaken idea that obnoxious mosquitoes were breeding there (although actually the high acidity of the water disfavors this, the great nuisance-producing grounds of the region being the alkaline coastal marshes). They proceeded to dig ditches to drain away such water as did occasionally collect, and this resulted in increasing the frequency of hay-cutting, and so lessening the opportunity for seed-production on the part of the rare species.

Moreover, local naturalists reported hearing discussions of a more serious threat. Modern communities need dumping grounds for trash, and depressions situated close to highways, and seemingly producing nothing of economic interest, are very attractive from this standpoint.

Cape May is much visited by ornithologists and other naturalists, and many of them stay over night in Mrs. Shaffer's rooming house at Cape May Point. During 1948 the idea of setting aside these bog areas as a nature sanctuary was discussed by groups there, and Mr. J. D'Arcy Northwood, then Secretary-Treasurer of the New Jersey Audubon Society, started inquiries as to the possibilities of this. During the Fall of 1949 Mr. Northwood and Mr. Robert C. Alexander, the President of that Society, were having lunch at a restaurant at the Airport, and were discussing the difficulty of finding who owned the bogs; and by a fortunate chance their conversation was overheard by a man seated nearby. He introduced himself as Mr. W. C. Pritchard, and as the owner of the area in which they seemed to be interested. Negotiations were soon started, and on July 3, 1950, a deed to 3.2 acres of the bog land was obtained by the Society. As in order to round out the Sanctuary it seemed desirable to increase the area held, and in particular to include a strip of woodland between the two major depressions, further arrangements were made and on September 12, 1955, a second purchase increased the total area to slightly over 6.5 acres.

In October, 1955, the Bennett Bog Sanctuary was formally dedicated in honor of two eminent Cape May naturalists, Henry Walker Hand (1870–1932) and Otway Horres Brown (1877–1946). For this achievement in conservation every local botanist, plant geographer and nature photographer owes a debt of gratitude to the New Jersey Audubon Society.—E. T. W.

Molinia caerulea at Home in Wayne County

Like the man who came to dinner, the grass *Molina caerulea*, a European visitor, whose occurrence in Wayne County was reported in Bartonia, No. 23, 1944–45, seems destined to become a permanent member of the flora of that area. It still flourishes over the same few acres, and with *Deschampsia flexuosa*, dominates the vegetation of this field. The soil here has not been cultivated, nor the land pastured for many years.

A striking characteristic of this grass is its growth in large clumps, with a root system that defies attempts to excavate it. The root-masses are about a foot in diameter, and support 12 to 20 culms, 30 to 40 inches high.

The farmer who owns the land says it is not worthwhile to attempt to cultivate the field, as the roots can be removed only with great difficulty, and then would have to be collected into windrows and burned before the ground could be tilled. The grass also seems too coarse for forage. In Europe the culms are recorded as being used in fishing villages for making ropes, and elsewhere in the manufacture of a poor grade of broom.

This grass has been reported as introduced in the United States in several northeastern states. This field in Scott Township, Wayne County, is the only area in Pennsylvania where it is known to have established itself.—W. L. DIX, *Shehawken, Pa.*

IN MEMORIAM

Harry S. Tillotson	June 7, 1955.
Howard W. Elkinton	July 3, 1955.
Horace E. Thompson	July 19, 1955.
Campbell E. Waters	July 29, 1955.
Howard Wood, Jr.	January 18, 1956.
Elmer D. Merrill	February 26, 1956.
J. Russell Bebler	April 17, 1956.
Edward E. Wildman	May 6, 1956.
Robert R. Tatnall	June 24, 1956.
D. Walter Steckbeck	October 14, 1956.

J. Russell Bebler (d. 1956) was an active member of the Philadelphia Botanical Club of long standing, having joined in 1919. For many years he was Horticulturist in the service of the Fairmount Park Commission.

Howard W. Elkinton (d. 1955) joined the Club in 1931. He was Executive Secretary of the Carl Schurz Memorial Foundation, and was active in a number of organizations under the sponsorship of the Society of Friends. His chief botanical interest was historical, with special reference to the local region.

Elmer D. Merrill (1876–1956), a corresponding member of the Club since 1945, was one of the world's leading botanists. Accounts of his life and work have appeared in many technical journals. He contributed articles to Bartonia Nos. 23, 24, and 25.

D. Walter Steckbeck (1880–1956) joined the Club in 1925. After studying at the West Chester State Teachers College and the University of Pennsylvania, he taught botany in the latter for 43 years, retiring with the rank of Associate Professor in 1952.

Robert R. Tatnall (1870–1956) became an active member of the Club in 1928 and served as its Secretary from 1932 to 1939. He took his doctor's degree in Physics at Johns Hopkins University, and taught this subject in various institutions, becoming associated with a Philadelphia industrial firm as a consulting physicist in 1919. At this time he returned to reside in his native city of Wilmington, Delaware, and renewed his studies of the local flora, which had been inspired by his uncle, Edward Tatnall, who published a flora of Newcastle County in 1860. Taking over the Curatorship of the Herbarium of the Society of Natural History of Delaware, he developed it into an excellent collection. Though suffering from " hay fever " due to grass pollen, he carried on extensive field work, ultimately publishing an excellent Flora of Delaware and the Eastern Shore, in 1946. A delightful field companion, he always could see the lighter side of every happening; and his Flora, though put through the press at the time of a serious illness, was most carefully edited.[1]

Horace E. Thompson (d. 1955) joined the Club in 1920. He served for many years as Secretary of the Western Saving Fund Society, and as hobbies included the study of wild flowers and the culture of tropical fish.

Harry S. Tillotson (d. 1955) became an active member in 1951. He was a specialist in photo-engraving, being employed by the Curtis Publishing Co. and later the Beck Engraving Co. He wrote articles, mostly for juvenile magazines, under the pen-name of Stanhope Taylor. He also made charming water color studies of wild flowers, being especially skilful in bringing out the beauty of the tiny florets of so-called " weeds." Series of these were presented to the Academy of Natural Sciences and the Free Library of Philadelphia.

Campbell E. Waters (1872–1955) was our Corresponding Member of longest standing, having been elected in 1904. As a youth he became interested in native ferns, and in 1911 published an attractively written and illustrated book on these plants. Although entering the chemical profession, and serving in that capacity for many years at the U. S. Bureau of Standards in Washington, D. C., he remained an active fern student, field botanist, and wild flower gardener.

Edward E. Wildman (1874–1956) joined the Club in 1931 and was designated an Honorary Member in 1949. A special tribute to his memory prepared by his long time friend Dr. William W. Cadbury appears on following pages.

Howard Wood, Jr. (1877–1956) was an active member of the Club since 1944. For many years he served as President of the Alan Wood Steel Co., studying wild flowers as a hobby.

---

[1] There was one amusing mixup: facing page 81 there is a plate of *Helonias bullata*, and in the legend reference is made to "sixty foot-high flower-heads." It happened, however, that the photograph was taken at such an angle as to look like a group of trees, so that the hasty reader could readily assume that the plants were sixty feet high! Dr. Tatnall freely admitted that this height was slightly exaggerated.

Edward E. Wildman, Our Honorary Member

In the passing of Dr. Edward Embree Wildman the world has lost a scientist and an educator who used his talents for constructive and spiritual ends; a beloved and devoted friend whose gentle, understanding fellowship was always available to young and old alike.

Edward E. Wildman was born at Salina, Ohio, on October 19th, 1874, and died suddenly at Moorestown, N. J., on May 6, 1956, thus in his 82nd year. He was the son of John and Mary T. (Pugh) Wildman, and a birthright member of the Wilmington, Ohio, Yearly Meeting of the Society of Friends.

Edward graduated from Salina High School in 1898, and then attended the Normal School at Spiceland, Ohio. For two years he was engaged in teaching in Indiana schools, and from 1899 to 1901 at the Westtown Boarding School, Westtown, Pa. He later entered Earlham College at Richmond, Ind., but after two years transferred to the University of Pennsylvania, taking the B.S. degree in 1904. He served here as an Assistant Instructor in the Department of Botany and Zoology.

After spending two years at the Central College of Missouri, he returned to Philadelphia in 1906, becoming Professor of Biology of this city's Central High School. While here he took the M.S. degree and ultimately his Ph.D. in 1912. He was then made head of the Science Department of the West Philadelphia High School for Girls, which position he held until 1926. He was next appointed Director of Science for the Philadelphia School District, holding this post until 1939. In the latter year he became head of the Department of Science in the newly formed John Bartram High School, in West Philadelphia.

While engaged in these administrative positions, Dr. Wildman found time and energy to accomplish many other things. During the summers from 1908 to 1911 he served as an Instructor in the Marine Biological Laboratory at Woods Hole, Mass. For three years, 1939 to 1941, he was a consultant for the Committee on Education and Participation in Science of the American Philosophical Society. This Society later awarded him a grant for the preparation of a compilation of the letters of John Bartram. He did not live to see this brought to the stage of publication, but his manuscript is on file in the Society's library, and available for future scholars working on botanical history.

For some twenty summers Dr. Wildman was engaged as leader of a Nature Study group at Pocono Manor, in Monroe Co., Pa. Here he took groups on short field trips and conducted classes on the porch of the Manor; one day he might be found setting up a nature exhibit, another filling little vials with sweetened water, wrapping them in red paper, hanging them up on a branch, and waiting for the certain arrival of the humming birds, to the constant delight of a group of spectators seated on the porch. Once a group of us had the privilege of accompanying him on a quest for cardinal flower plants, to be naturalized on the banks of his beloved Swiftwater Creek.

Frequently he would lead a group of Boy Scouts to the mountain south of the Manor, which was part of the land wrongfully taken from the Lenape Indians on the basis of the infamous " Walking Purchase." Then he could emphasize to the boys that moral wrongs have adverse spiritual reactions on the perpetrators as well as injury to others. In this case, there followed bloody massacres and wars of revenge.

With the idea of encouraging the study of Nature in the field, Dr. Wildman wrote a number of articles and pamphlets along this line, covering what could be seen at different seasons. After a long and patient search for trees still living, which the evidence showed to have been well grown when William Penn came to America in 1682, 250 years before, he published in 1933 a most interesting little book, " Penns Woods; " this was later reissued in a second edition, including reports which came to him from readers of the first who knew of " Penn Trees " that had not come to his attention. This book was pleasantly dedicated " To the memory of a wise and saintly mother, Mary Taylor Pugh Wildman, who encouraged her son's interest in Natural History from early childhood."

Upon his retirement from active administrative work in 1942, Dr. Wildman spent much time going through the herbarium of the Academy of Natural Sciences searching out type specimens, in which this herbarium is very rich, but which had been largely hidden by being filed among general collections. Each specimen was duly placed in a separate folder, on which was written the place of publication of its name, the result of a vast amount of literature search by him in the Academy's library. Now housed in a series of special modern cases, this Type Collection is a fitting monument to his memory.

After having lived for many years at 4331 Osage Ave., in West Philadelphia, the Wildmans moved a short time ago to Moorestown, New Jersey. It was there that he had, in 1909, married Bertha J. Otis, who survives him, as do also their son, Dr. Edward D. Wildman, and daughter, Jessie Webster, of Purdue, Indiana. —WILLIAM W. CADBURY.

Program of Meetings

Date	*Subject*	*Speaker*	*Attendance*
1954			
Jan. 28	Trials, Tribulations and Triumphs in Writing a State Flora	John M. Fogg, Jr. & Herbert A. Wahl	43
Feb. 25	Glimpses of the Tree Species and Forests of the Pacific Northwest	J. R. Schramm	35
Mar. 25	Botanical Exploration in Coral Atolls	F. R. Fosberg	36
Apr. 22	Exploration in the Marshall Islands	Edwin T. Moul	36
May 27	Eastern Asiatic Plants in American Gardens	Hui-Lin Li	38
Sept. 23	Report by Members on Summer Experiences		22
Oct. 28	A Botanist's Impression of India	John M. Fogg, Jr.	50
Nov. 18	Glimpses of Las Villas, Cuba	C. Earle Smith, Jr.	26
Dec. 16	Forty Years of Fern Collecting	Edgar T. Wherry	40
1955			
Jan. 27	Orchid Hunting, Gaspé to Florida	Walter Palmer	33
Feb. 24	Birth of an Arboretum	Gordon Tyrrell	35
Mar. 24	How to Conserve our Streams	Dr. Ruth Patrick	30
Apr. 28	Seeing Little Spots in a Big Way	Richard B. Chillas, Jr.	27
May 26	Wild Flowers of the Eastern United States	Harry A. Webster	27
Sept. 22	Report by Members on Summer Experiences		23
Oct. 27	Botanical Excursions to Costa Rica and Panama—1954–55	Theodor P. Haas	58
Nov. 17	A Botanist's Impressions of Burma and Thailand	John M. Fogg, Jr.	43
Dec. 15	Favorite Flowers from Far and Near	Edgar T. Wherry	35
1956			
Jan. 26	The Big Bend Country of Texas	Mrs. J. Norman Henry	42
Feb. 23	New Lilies and Their Development	Jan de Graaff	20
Mar. 22	An Expedition to Peru	Dr. Ruth Patrick	35
Apr. 26	Botanical Gardens in Ancient Mexico	Mrs. Ida K. Langman	32
May 24	Some Uncommon Plants of the Southern Appalachians	Ralph M. Sargent	36
Sept. 27	Report by Members on Summer Experiences		11
Oct. 25	Motoring Thru the Andes in Peru, Bolivia, and Chile	Miss Josephine de N. Henry	41
Nov. 15	Some European Botanical Gardens	John M. Fogg, Jr.	42
Dec. 20	Exploring for Ferns	Edgar T. Wherry	35

Officers, 1954–1956

MRS. J. NORMAN HENRY, *President*
HUGH E. STONE, *Vice President*
WALTER M. BENNER, *Secretary*
HARRY W. TRUDELL, *Treasurer*
BAYARD LONG, *Curator*
EDGAR T. WHERRY, *Editor*

Active Members (as of January 31, 1957)

	Elected
WALTER AINSWORTH, 71 Franklin Boulevard, Pontiac, Mich.	1946
MRS. SADIE ASHENDORF, 5014 Erringer Place, Philadelphia 44, Pa.	1954
MRS. F. E. ATKINS, 3422 Queen Lane, Philadelphia 29, Pa.	1953
MRS. A. C. BARNES, Box 128, Merion, Pa.	1942
EDWIN B. BARTRAM, Bushkill, Pa.	1906
DR. WALTER M. BENNER, 5636 Loretta Ave., Philadelphia 24, Pa.	1912

Dr. David Berkeimer, Limekiln, Berks Co., Pa.	1943
Carl E. Bliss, Chagrin Road, R.D. 1, Chagrin Falls, O.	1924
Miss Ethel Brubaker, Beech Dale, Bird in Hand, Pa.	1939
William C. Brumbach, Esterly, Pa.	1943
Miss Margaret Butler, 4598 Castor Ave., Philadelphia 24, Pa.	1953
Dr. William W. Cadbury, 274 W. Main St., Moorestown, N. J.	1950
Richard B. Chillas, 233 Winona Ave., Philadelphia 44, Pa.	1942
John W. Coburn, 120 Nippon St., Philadelphia 19, Pa.	1951
Miss Carola S. Collings, 1728 Pine St., Philadelphia 3, Pa.	1954
W. L. Dix, 801 Crown St., Morrisville, Pa.	1942
Mrs. Paul Domville, 311 Hilldale Road, Villanova, Pa.	1956
Albert Donaghy, Jr., 203 E. Wellens St., Philadelphia 20, Pa.	1952
Robert R. Dreisbach, 301 Helen St., Midland, Mich.	1922
Miss Elizabeth C. Earle, 4209 Chester Ave., Philadelphia 4, Pa.	1935
Mrs. Nellie Erisman, 508 S. 41st St., Philadelphia 4, Pa.	1945
Mrs. Harold Evans, Awbury, E. Washington Lane, Philadelphia 38, Pa.	1931
Carl W. Fenninger, 100 W. Moreland Ave., Philadelphia 18, Pa.	1947
Albert J. Ferkel, 1101 N. 63rd St., Philadelphia 31, Pa.	1948
Miss Elizabeth H. Flavell, 245 Sumac St., Philadelphia 28, Pa.	1946
Dr. John M. Fogg, Jr., 6807 Quincy St., Philadelphia 19, Pa.	1921
William L. Freyburger, 1036 Larchmont Ave., Havertown, Pa.	1956
Fairman R. Furness, Media, Pa.	1935
Miss Elizabeth A. Gest, 733 Waverly Road, Bryn Mawr, Pa.	1944
John Gill, 2 Linden Ave., Haddonfield, N. J.	1939
Dr. Thomas S. Githens, Cambridge Apts., Philadelphia 44, Pa.	1945
Dr. Robert B. Gordon, 415 Sharpless St., West Chester, Pa.	1942
Dr. Theodor P. Haas, P.O. Box 1732, Philadelphia 5, Pa.	1946
Louis E. Hand, Natchez Trail, Medford Lakes, Medford, N. J.	1936
Miss Ann Harbison, The Barclay, 18th & Rittenhouse Sq., Philadelphia 3, Pa.	1944
Mrs. J. Norman Henry, Gladwyne, Pa.	1932
J. Norman Henry Jr., 410 Mulberry Lane, Haverford, Pa.	1956
Miss Josephine de N. Henry, Gladwyne, Pa.	1938
Mr. A. H. Holcombe, Jr., 1330 Youngs Ford Road, Gladwyne, Pa.	1949
Mrs. A. H. Holcombe, Jr., 1330 Youngs Ford Road, Gladwyne, Pa.	1949
Miss Nancy E. James, 4043 Baltimore Ave., Philadelphia 4, Pa.	1942
Prof. Marion A. Johnson, Rutgers University, New Brunswick, N. J.	1946
Robert L. Kendig, Street Road, Davisville, Pa.	1955
Addison Kern, 222 W. Linton St., Philadelphia 20, Pa.	1954
Miss Natalie B. Kimber, 538 E. Locust Ave., Philadelphia 44, Pa.	1928
Ludwig A. Koelnau, 2038 Race St., Philadelphia 3, Pa.	1952
Mrs. Ida K. Langman, 3509 Baring St., Philadelphia 4, Pa.	1937
Miss Elizabeth H. Lewis, 400 S. 45th St., Philadelphia 4, Pa.	1954
Dr. Hui-Lin Li, Morris Arboretum, Philadelphia 18, Pa.	1944
Dr. Harry A. Lloyd, 200 N. 35th St., Philadelphia 4, Pa.	1931
Bayard Long, 250 Ashbourne Road, Elkins Park, Philadelphia 17, Pa.	1906
James McClurken, 1623 E. Berks St., Philadelphia 25, Pa.	1953
William G. McEwing, 1343 S. Lindenwood St., Philadelphia 43, Pa.	1955
John R. McIntosh, 304 Winona Ave., Philadelphia 44, Pa.	1945
Dr. Edwin T. Moul, Rutgers University, New Brunswick, N. J.	1945
George F. Nicklas, 82 Evanson Ave., Clementon, N. J.	1951

Dr. Frederick M. Oldach, 323 Wellesley Road, Philadelphia 19, Pa.	1951
Mrs. George B. Orr, Willow Brook Farm, Paoli, Pa.	1935
Miss Elizabeth G. Ostheimer, Jenkintown, Pa.	1933
Dr. Samuel C. Palmer, 403 N. Chester Road, Swarthmore, Pa.	1929
Walter Palmer, Route 16, Media, Pa.	1952
Mrs. Frank Parker, 400 S. 45th St., Philadelphia 4, Pa.	1950
Dr. Ruth Patrick, P.O. Box 4301 Chestnut Hill Sta., Philadelphia 18, Pa.	1937
Harold W. Pretz, 123 S. 17th St., Allentown, Pa.	1909
Miss Helen Rauch, 734 Homestead Ave., Havertown, Pa.	1956
Dr. Charles W. Reimer, 2341 Cedar Lane, Holmes, Pa.	1953
Dr. Robert Robbins, Temple University, Dept. of Radiology, Philadelphia 40, Pa.	1954
Frank Robinson, 871 Preston Street, Philadelphia 4, Pa.	1957
Mrs. Philip Q. Roche, Harts Lane, Miquon, Conshohocken, R.D. 1, Pa.	1953
Miss Anne Rowland, Meadowbrook, Pa.	1948
Mrs. Karl Rugart, 612 Bryn Mawr Ave., Penn Valley, Narberth, Pa.	1942
Dr. Ralph M. Sargent, 4 College Circle, Haverford, Pa.	1948
Dr. Robert L. Schaeffer, Jr., 30 N. 8th St., Allentown, Pa.	1938
Dr. C. Earle Smith, Jr., Academy of Natural Sciences, Philadelphia 3, Pa.	1953
Dr. Robert V. Speck, 737 Cedar Ave., Haddonfield, N. J.	1947
Mrs. Robert V. Speck, 737 Cedar Ave., Haddonfield, N. J.	1947
Dr. C. I. Stiteler, 507 Welsh Street, Chester, Pa.	1945
Hugh E. Stone, White Hall Apts., Haverford, Pa.	1892
Miss Mary Sullivan, Montgomery Court L23, Narberth, Pa.	1954
Mrs. Howard W. Taylor, Monk Road, Gladwyne, Pa.	1952
Miss Elizabeth Thorp, 403 S. 41st St., Philadelphia 4, Pa.	1953
Robert J. Titherington, 6317 N. Norwood St., Philadelphia 38, Pa.	1942
Harry W. Trudell, 1309 Highland Ave., Abington, Pa.	1915
Dr. Elizabeth A. Valentine, P.O. Box 186, Furlong, Pa.	1949
Mrs. J. H. Vance, 148 Montgomery Ave., Bala-Cynwyd, Pa.	1950
Charles Van Housen, 5022 Erringer Place, Philadelphia 44, Pa.	1954
Miss Hilda Vilkomerson, c/o Biological Abstracts, 3815 Walnut St., Philadelphia, Pa.	1955
Dr. Paul R. Wagner, 789 Main St., Collegeville, Pa.	1935
E. Perot Walker, 511 Lynmere Road, Bryn Mawr, Pa.	1939
Mrs. M. L. Warnke, 65 S. Main St., Manheim, Pa.	1935
Miss Hilda L. Weber, 1020 Earl St., Philadelphia 25, Pa.	1950
Miss Evelyn Wells, 3924 Locust St., Philadelphia 4, Pa.	1947
Robert F. Welsh, 1 N. 13th St., Philadelphia 7, Pa.	1909
Dr. Edgar T. Wherry, 228 Harvey St., Philadelphia 44, Pa.	1925
Hans Wilkens, 424 S. 15th St., Reading, Pa.	1928
Miss Elizabeth Wistar, 200 Montgomery Ave., Philadelphia 18, Pa.	1952
William H. Witte, R.D., Riegelsville, Pa.	1898
Miss Mary F. Wright, 231 Winona Ave., Philadelphia 44, Pa.	1928

Corresponding Members

Dr. Harold St. John, University of Hawaii, Honolulu, T. H.	1927
Dr. William Randolph Taylor, University of Michigan, Ann Arbor, Mich.	1921
Dr. Heber W. Youngken, Massachusetts College of Pharmacy, Boston, Mass.	1918

31